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This handbook was compiled to assist OECD Member countries in the long term development of their educational statistics and to provide them with a basis of comparison for the collection of internationally comparable statistics useful to educational planners. Recent methodological approaches to long term planning are also discussed. The statistics considered are those required to project in the medium and long term the main magnitudes in the educational system--pupils, graduates, teachers, buildings, costs, and expenditures. The chapter headings present a clear picture of exactly which aspects of educational planning are included (1) Elements of an educational flow model, (2) sociological aspects, (3) manpower requirements, (4) an integrated conceptual framework, (5) the costs of education--methods of analysis and projection, (6) a statistical tabulation scheme, (7) the collection and processing of data, (8) international comparisons, and (9) directions for further work. (HW)

METHODS
and
STATISTICAL
NEEDS
for
EDUCATIONAL
PLANNING

ED023174

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
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METHODS and STATISTICAL NEEDS for EDUCATIONAL PLANNING

ED023171

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

The Organisation for Economic Co-operation and Development was set up under a Convention signed in Paris on 14th December 1960 by the Member countries of the Organisation for European Economic Co-operation and by Canada and the United States. This Convention provides that the OECD shall promote policies designed :

- *to achieve the highest sustainable economic growth and employment and a rising standard of living in Member countries, while maintaining financial stability, and thus to contribute to the development of the world economy;*
- *to contribute to sound economic expansion in Member as well as non-member countries in the process of economic development;*
- *to contribute to the expansion of world trade on a multilateral, non-discriminatory basis in accordance with international obligations.*

The legal personality possessed by the Organisation for European Economic Co-operation continues in the OECD, which came into being on 30th September 1961.

The members of OECD are : Austria, Belgium, Canada, Denmark, France, the Federal Republic of Germany, Greece, Iceland, Ireland, Italy, Japan, Luxembourg, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, the United Kingdom and the United States.

FOREWORD

This handbook has been prepared in response to a request from the European Ministers of Education at their fourth Conference held in London in April, 1964. Resolution number 2 on Planning and Investment in Education, adopted by the Ministers at that Conference, contained the following recommendation :

> « That OECD, whose work in this field is greatly appreciated, be invited to formulate clearly in a model handbook the various factors involved in effective educational investment planning so that the countries represented may have a basis for the compilation of comparable statistics. »

This request was discussed by the OECD Committee for Scientific and Technical Personnel in June 1964 and, with the endorsement of the Council of the Organisation, the proposal to prepare the handbook was incorporated into its 1965 and 1966 programmes of work.

The purpose of the handbook is to assist OECD Member countries in the long-term development of their educational statistics and to provide a basis for the collection of internationally comparable statistics useful to educational planners in OECD Member countries. It discusses recent methodological approaches to educational planning and out of this discussion a series of tabulations is derived which it is recommended should be available to educational planners on a regular routine basis. It does not consider in any detail the vast number of special statistical studies which might be undertaken from time to time in connection with specific aspects of educational planning. The principal recommendations are :

i) that educational statistics should be gathered in such a way as to permit the integration of manpower, social and individual demand, and cost and financial aspects of educational planning ;

ii) that efforts should be made to develop individualised data systems of pupils, teachers and educational institutions. It is suggested that such data systems should make use of automatic data processing methods ;

iii) that more attention be paid to the analysis of educational costs and expenditures and that particular efforts be made to gather statistics for this purpose.

The handbook also proposes a comprehensive framework for the compilation of comparable educational planning statistics from OECD countries, taking into account the work of other international organisations, particularly UNESCO and the Council of Europe.

It should be clearly understood that in the context of the present volume, educational planning is taken to mean a process that is fairly long-term and concerned with educational policy at a rather aggregated level. The handbook does not deal with statistical data for the numerous administrative decisions that must be made in the short period both in connection with managing educational institutions and with detailed implementation of the plan. It is concerned with those statistics which are required to project or to plan in the medium and the long term, the main magnitudes in the educational system — pupils, graduates, teachers, buildings, costs, expenditures. It is also concerned with the main quantifiable attributes of these basic magnitudes which are relevant for long and medium-term decision making These include numbers of pupils in each of the broad areas of specialisation, certain social economic characteristics of pupils, sex, age, qualifications and other attributes of teachers, and the analysis of expenditures according to branch of education, purpose and source of finance.

The handbook has been prepared by the Secretariat of the OECD Directorate for Scientific Affairs in co-operation with experts in educational planning and statistics in OECD Member countries. The direct responsibility for the work in the Secretariat was with Gareth Williams of the Educational Investment and Development Division, assisted by Eva Ryten, Yvonne Sallé, Monique Solliliage and Solomon Wald. Specific contributions by national experts from the Member countries are too numerous for all to be mentioned individually. Many of these are acknowledged in the relevant parts of the text. Special mention, however, should be made of the valuable assistance received from Kjell Eide, Hans Kullmer, Philip Redfern and Natalie Rogoff-Ramsøy.

Preliminary drafts of the handbook were discussed at a special conference of national educational statisticians in February 1966 (the list of participants is given at the end of the volume). The final version presented here has been endorsed by a Recommendation of the OECD Council « as a suitable framework for the compilation of comparable educational statistics. » The Recommendation also urges Member countries « to develop their programmes of educational statistics along the lines indicated in the handbook, in so far as it is possible in the conditions prevailaing in each country. »

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Chapter I

PURPOSES OF THE HANDBOOK

INTRODUCTION

1. This handbook represents an attempt to set out systematically the statistical implications of recent developments in the theory and practice of educational planning. It subsequently considers the utility of international comparisons to national educational planners, and makes proposals for the collection of data from which a wide range of comparisons can be made.

2. The handbook is not concerned with what may be termed the wider aims of education. Educational planners are usually well aware that their quantitative estimates of pupil numbers, teacher and building needs and financial requirements are only the first step in planning education for economic and social development, and that they must pay equal attention to the development of the structure of education and the provision of curricula that accord with broad social and political aspirations. The present volume is, however, concerned with suggesting a suitable statistical basis for the quantitative first step.

Educational Planning

3. From the point of view of the economic and social planner, education and training are among the means by which young people are prepared for adult life[1]. A major part, though by no means all, of the adult life of many people is in a broad way concerned with remunerative work and contributing thus to the individual's own well-being and to that of society in general. One important function of the educational system in a modern society is, therefore, to ensure that roughly the « right » amount of the various kinds of educational qualifications required by a healthy economy are forthcoming. From an economic point of view an educational system which produces excessively large numbers of young people hoping and qualified to enter occupations for which there is little foreseeable economic demand may be said to be failing in its tasks and so may a system producing inadequate numbers of people with qualifications or aptitudes that the economy does require. It is failing individuals, who will be disappointed because in the one case they cannot make good use of the qualifications they have invested their young life in obtaining, or in the second case because they have not obtained the qualifi-

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[1] The educational system is also increasingly viewed as having an important function in retraining adults, either to provide them with new skills when structural changes in the economy have rendered their existing skills obsolete or to bring their existing skills up to date in the light of technical advances that have been made since they left school or university.

cations for which there has proved to be high economic demand (and hence probably high salaries and high social status); and it is failing society by not ensuring the best preparation and utilisation of its valuable human resources. The educational planner is also becoming increasingly interested in the education and retraining of adults to meet the needs of economic and technological change.

4. At the same time, since education bestows such valuable direct and indirect benefits on its recipients, it is desirable that, bearing in mind the economic needs mentioned in the previous paragraph, each individual receive the education best suited to his inherent individual capacity and wishes. Furthermore, in most countries it is now an explicit aim of educational policy that educational opportunity be equitably distributed.

5. It is now widely accepted that some measure of educational planning is necessary to ensure that the educational system discharges in an efficient manner its heavy responsibilities to the rest of society. These responsibilities are incurred in part because the educational system is a very heavy user of economic resources, amounting in some cases to 10 per cent of gross national product and in part because economic and social development are considered desirable and it is believed that if used properly education can make very important contributions to such development. It is also realised that in a complex modern society with rapidly increasing educational participation, the sometimes conflicting aims of equality of opportunity, meeting the manpower needs of the economy and individual freedom of choice in education can be promoted only with a substantial measure of planning.

6. Educational planning encompasses the provision of information necessary for framing and implementing appropriate policies in the short, medium and long terms, with regard to the numbers of pupils and students in each branch of education, and the adjustment of the outflow of persons from each branch of education in accordance with economic and social needs. It is concerned with the orientation of flows of pupils into and within the educational system in accordance as far as possible with individual desires and the principles of equity and efficiency. It includes the main policy problems involved in creating a supply of teachers of various types sufficient to ensure that pupils and students[1] are adequately instructed. It is concerned with ensuring that adequate buildings and equipment are available and that they are used in an economically efficient way. The educational planner is required also to estimate the expenditure necessary to carry out the proposed programmes, to investigate possible sources of finance and to promote the efficient utilisation of financial resources. He is not, in general, interested in day-to-day questions of school administration; nor with questions of mainly pedagogical interest such as the content of courses, teaching methods, or examination procedures, except in so far as they have significant implications for the activities mentioned above.

7. In general, social and economic statistics are expensive to obtain. It is uneconomical to collect statistics without a reasonably clear idea of the purposes for which they are to be used. It is necessary therefore to establish rather more precisely the questions to which the educational planner is

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[1] The words «pupil» and «student» are used synonymously in this handbook.

trying to provide answers. This serves a twofold purpose. First it establishes a set of criteria against which to judge the need for each set of data proposed. Secondly, since the number of problems for which educational administrators require statistical data is almost infinite, it indicates the limits of the handbook, thus saving the reader from vainly seeking in it a treatment of problems that it does not attempt to tackle. It is appropriate to point out that the handbook is concerned only with « primary » statistics. If they are collected and presented properly, such primary series permit the derivation of a wide range of « secondary » statistics.

8. These basic data are of two types. In the first place, there are statistics of the educational system itself — pupils, teachers, buildings expenditures, etc. Secondly, there is a large amount of supplementary data required by educational planners for the calculation of forecasting and planning coefficients within the educational system. These include demographic, economic and social data. Such data are not included in the proposed tabulation scheme except where :

- *i*) they are of overwhelming importance for making educational forecasts, e.g. data by age on the population of school age.
- *ii*) the statistics in the form required are unlikely to be collected for purposes other than educational planning, e.g. the required tabulations of occupation by educational characteristics and branch of activity are unlikely to be produced except to meet the needs of educational planners.

9. The principal planning problems dealt with in this handbook are enumerated below.

- *a*) How should the size and structure of the educational system develop during the next few decades ?
- *b*) How many pupils should be catered for in each of the main branches of education during the next two or three decades ? This basic question breaks down into a number of important components :
  - *i*) How many children are likely to be starting their formal education ?
  - *ii*) At what age will they enter the system and which branches will they enter ?
  - *iii*) How many pupils will terminate their formal education during the planning period ?
  - *iv*) Between entering and leaving education, which different branches will pupils enter and how long will they spend in each ?
  - *v*) What is the structure of the school population in terms of sex, socio-economic background, geographical distribution, etc., how is this structure likely to develop, and what will be the effect of these developments on the forecasts made under (*i*) (*ii*) (*iii*) (*iv*) above ?
  - *vi*) How are people with various educational qualifications distributed in the labour force and non-active population and how many people with different types of educational qualifications will the economy be needing throughout the planning period ?
  - *vii*) Will the *anticipated outflow* from the system implied by (*i*) (*ii*) (*iii*) (*iv*) match the *required outflow* implied by (*vi*) ? If not, is it

desirable to attempt to modify present trends, or can society absorb the discrepancy by changing its occupational structure, or otherwise in such a way that the loss of welfare involved in not meeting economic needs is more than matched by the gain in welfare in permitting individual freedom of choice about which institutions to enter? Alternatively, can the discrepancy be filled by making more use of adult training or supplementary training schemes for school leavers?

c) How many teachers with each level and type of qualification will be required in each of the main branches of education during the planning period?

d) Is the best use being made of the existing teacher force and other members of the population with teaching qualifications and experience?

e) How many teachers with each type of qualification should enter each branch of education during each year of the planning period?

f) What other personnel besides teachers (administrators, inspectors, auxiliary personnel, etc.) will be needed?

g) Are existing school buildings adequate for current educational needs and are they being efficiently utilised?

h) How many and what type of educational buildings should be constructed during each year of the planning period?

i) What should be the expenditure on each branch of education during each year of the planning period?

  i) How much must be spent on teachers' salaries?
  ii) How much must be spent on equipment?
  iii) How much capital expenditure is necessary?
  iv) How much should be devoted to the provision of ancillary facilities; student grants school meals, sports facilities, etc.?

j) What are likely to be the main sources of the finance necessary to carry out the plan? How much of the burden must be borne by public authorities?

k) What will be the role of part-time education?

l) What will be the contribution of part-time teachers?

m) What will be the role of informal education?

n) What is likely to be the role of private education under each of the above headings?

10. It is generally agreed that the dynamics of educational systems make many aspects of educational planning an undertaking in which it is often necessary to try to look several decades ahead. This does not, however, relieve the educational planner of the need to make detailed short and medium term plans. For some purposes annual estimates are needed, at least for the first five years, for others forward estimates at five-year intervals are adequate. Much educational planning at present has been concerned with peering a decade or more into the future and has not been effectively linked with the short term in which decisions are actually made.

11. In this context the frequency of data collection is important. It is usual for educational statistics to be collected annually, corresponding to one observation in each school year. It is clear, however, that some data

could usefully be collected more frequently whereas others might be collected at much longer intervals.

12. It may also be remarked in this connection that all statistics do not need to be gathered from the whole school population. Clearly, all pupils and all teachers must be counted ; but much of the information on the individual characteristics of teachers and pupils can conveniently be obtained from sample surveys.

13. Since a major part of this handbook is concerned with proposals for the development of statistics to record the flows of pupils and teachers into, within and out of the educational system, it is useful to point out at the outset that there are two important but separate aspects of the development of « flow » statistics. In the first place there is the formulation of a suitable analytical framework to present flow statistics. This is undertaken in Chapter II. Secondly, it is necessary to establish a machinery for data collection and processing on the basis of individual records that will exploit the full potential of this conceptual framework. This is considered in Chapter IX. It will become clear during subsequent chapters that though in an ideal system they are closely linked, these are two quite separate concepts that should not be confused. The development of a suitable analytical framework need not wait upon the establishment of an individualised data system, whereas, individualised data on teachers and students has many uses besides that of improving forecasting and planning which is the main aim of the present handbook.

International Comparisons

14. Following the examination of the statistics needed for effective educational planning, an attempt is made to ascertain the use that can be made of international comparisons. Broadly speaking, international comparisons are used in three ways.

i) They provide a basis for setting targets. At the political level this is often very important since the fact that country A has successfully achieved a particular educational objective is often considered a good reason for country B undertaking to reach the same objective ; enrolment ratios, teacher-pupil ratios, proportion of GNP devoted to education, financial aid to students are among the more well known examples of areas in which extensive use is made of international comparisons.

ii) At a more technical level, data from other countries can supplement national data in the estimation of forecasting parameters and coefficients when national data are inadequate. They can, in certain circumstances, supplement and substitute for time series data where these are not available. This can be particularly important in investigations of the way that economies make use of educated personnel where the nature of the problem is such, that in order to be useful, time series would need to be very long indeed.

iii) Possibly the most important use of internationally comparative statistics is, however, to provide a reliable quantitative basis for comparative policy studies of such matters as teacher supply, educational opportunity, finance of education ; grants to students, etc.,

> and for confrontations of national policies such as occur for example in OECD country reviews[1]. Such confrontations, which can be invaluable both for the country under review and for others participating in the confrontation, are immensely strengthened if they are based on statistics that can easily be interpreted in a variety of national situations.

15. The handbook, therefore attempts to provide a basis for a set of indicators of educational effort which will help individual countries to evaluate the magnitude and orientation of their educational achievements in relation to those of other countries at various stages of economic development.

Outline of Subsequent Chapters

16. In the light of the dual objective of this handbook, planning statistics and international comparisons, it has been found convenient to vent these topics separately. The first develops the basic statistical needs for educational planning[2], and the second formulates a tabulation scheme for comparing the educational efforts of OECD countries. The data proposed in the first part are not intended primarily for comparative purposes but rather, concern questions of principle, and hence there is little detailed consideration of definitions and systems of classification. In the case of the second part, however, it is vitally important that standardised and comprehensive definitions and systems of classification be used. It is to be hoped that subsequent work will enable a « conversion key » to be established for each country which will permit the national planning statistics to be converted readily into the international classification scheme. This proposal is dealt with in the final chapter of the handbook.

17. The basic points of departure for long-term educational planning that have been developed in recent years are dealt with in Chapters II and IV. These are often called « manpower requirements » and individual demand for places. » The manpower approach takes as its starting point the belief that one of the most important functions of the educational system is to provide the economy with the « right » amount of different types and levels of educational and professional qualifications. The demand for places approach starts from the assumption that the plans should de made in such a way that educational facilities are available to all who wish and are able to benefit from them[3]. The technique of the demand for places approach can also be

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[1] See for example the country reviews of national science policy, an intermittent series including at present Denmark, Greece, Norway, Sweden, Yugoslavia. See also *The Training of Technicians in Ireland* and *Higher Education* and the *Demand for Scientific Manpower in the United States.* (OECD Paris 1965).

[2] For a discussion of currently available educational statistics in European countries see *Statistics of the Educational System* memorandum presented by the UNESCO Secretariat to the Conference of European Statisticians meeting on Educational Statistics, 4th-8th October, 1965. The reference of this mimeographed document is UNESCO ss/6/72/WP Conf. Eur. Stats/WG23/2. A conclusion of this paper is that «no country possessed data for all the key cells blocked out in this exercise, although it would seem difficult to imagine a more minimum concept of basic data necessary to educational planning. »

[3] This basic assumption can be modified at a second stage of sophistication of educational planning models. See for example the treatment of the «bottleneck» problem in the papers from Norway, Sweden, United Kingdom in *Mathematical Models of Educational Planning* (OECD 1966).

used to formulate a more positive social policy in education. For example, it may be felt that policies should be designed in such a way as to increase the participation of those social and cultural groups that are not at present making full use of the facilities available. This is discussed in Chapter III.

18. In Chapter V the relationship between these two approaches is investigated, both theoretically and in terms of the statistical techniques and statistical data likely to be used in making educational plans. The general conclusion is that no realistic educational planning can ignore either the qualified manpower requirements of the economy or the desires of individuals, on broader social objectives such as the democratisation of educational opportunity.

19. Whichever of the two basic approaches is used for estimating educational needs, the estimation of costs and the planning of financial provision for the implementation of plans is a rather separate issue which up to now has often not been sufficiently well integrated into the educational planning process. The importance of making reliable detailed estimates of the costs of educational plans is obvious, though it is not nearly so clear what are the best methods of making these estimates. The problems are particularly acute in the case of capital expenditures[1]. Chapter VI discusses the analysis of the cost structure of the educational system and methods of estimating the costs of educational development plans.

20. The planning of financial provision is of less direct interest to educational planners. The educational planner may reasonably take the view that having calculated his requirements and having costed them to the best of his ability he merely presents the bill to the financial authorities who will accept or reject it in total or in part, according to the mysterious rules that govern the deliberations of those responsible for allocating finance among a number of different claimants. This view is, however, mistaken. Educational finance is not a single lump sum provided by a monolithic authority. Financial resources for education derive from central government, local government, public and private enterprises, households, schools themselves and other sources. In addition, there are often a number of financial transfers between the point at which funds are earmarked for education in general, and that at which they are actually spent on specific goods or services for the educational sector. It is through their influence on the purse strings that public authorities can most effectively implement many of the policies they wish to pursue ; but in order to do so efficiently they must have a thorough understanding of the various financial flows involved. For effective educational planning, which includes budgetary and financial control of educational programmes, it is necessary, as well as calculating overall monetary needs, to try to determine where the impact of providing the finance is likely to be felt. Before such forecasts can be made it is essential to try to develop a complete picture of the present situation with regard to the various financial flows that precede each item of expenditure on education. Annex V is devoted to an analysis of educational expenditures and of financial flows within the education sector.

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[1] For an analysis of ways of estimating required capital expenditures, and of exercising budgetary control of school building programmes, see *School Building Resources and their Effective Use*, by G.B. Oddie (OECD) 1966.

21. In Chapter VII the conclusions of the previous chapters are developed in more specific terms, and the elements of a basic tabulation scheme for pupils, teachers, educational expenditure and qualified manpower are formulated. The chapter does not present a definitive set of tabulations, but examples are given of the types of tables which would provide the data required by the planner, and it is believed that this chapter provides a basic framework within which national tabulation schemes could usefully be developed.

22. Data collection is considered in Chapter VIII, which outlines the various ways in which educational statistics may be obtained. Attention is also focused on the frequency with which different types of data need to be collected and on the possible use of sampling procedure. The collection of data on pupils and teachers by means of individual records[1] is discussed in this chapter and is returned to in the annexes where some existing schemes of individualised data collection are described.

23. Chapter IX deals with the second main subject of the handbook-international comparisons. It considers the use that national educational planners might make of international comparisons and the difficulties of making them. It attempts to establish areas in which international comparisons are likely to be particularly useful. Subsequently, a set of basic tables for the compilation of internationally comparable data is set out. They are accompanied by precise proposals for definitions and a systems of classification.

24. Finally Chapter X considers some areas which have been inadequately dealt with in this handbook and proposes areas in which further work is likely to prove fruitful.

25. In addition, the handbook contains a number of annexes dealing with practical examples of some types of data collection in OECD countries.

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[1] Usually called «Individualised Data» (I.D.) The term individual records is meant to include all methods of collecting and storing data on individual pupils and teachers (magnetic tape, cards, etc.)

Chapter II

ELEMENTS OF AN EDUCATIONAL FLOW MODEL

DEMAND FOR PLACES BY PUPILS

26. The point departure for this approach to educational planning is that access to all branches of education should be available to all those wishing to enter them who are qualified to do so, by ability and attainment. This is certainly the most frequent basis on which educational decisions are made, and even educational plans that purport to be based on other methods often base a large part of their estimates on what students and their families are thought to be demanding.

27. Traditional methods of forecasting the demand for places have depended upon forecasts of enrolment ratios in each branch of education based on projections of trends and correlations with national income and the demographic, geographic and socio-economic structure of the population, etc. The principal weakness of such methods is that they cannot easily take into account the inter-relationships between the various branches of education. In recent years, the techniques of making such projections have developed rapidly. The present chapter outlines the type of forecasting and planning models that are coming into use for forecasting student enrolments on the basis of individual demand for places, and for formulating educational policies on the basis of these forecasts.

28. In order to understand the mechanics of this approach to educational planning and indeed much of educational planning in general, it is convenient to start by examining the educational system as if it were a rather complex mechanised production system. The basic raw materials are human beings, usually children. As these raw materials proceed through the educational system, from one branch to another, they are transformed by the actions of teachers and educational equipment into educated, or at least partially educated, people. These educational processes usually take place in schools or universities.

29. The « inputs » into the educational process are thus children, teachers, equipment and buildings. The « outputs » are various types of educated people. In the first instance, attention may be concentrated on the « raw material » inputs only — pupils and students.

30. The initial input into the educational system in any country with effective compulsory education laws is very closely related to the number of births the relevant number of years previously. During the whole of the period of compulsory education, total enrolments of pupils at each age differ

very little from total population at that age and by far the most important basis for global enrolment projections is a reliable set of demographic forecasts. It is not a function of this manual to describe methods of making demographic forecasts. It is assumed that the educational planner will have before him detailed forecasts by individual year of age of the population of school age throughout the planning period. If these do not exist, the educational planner must make his own forecasts, using the best demographic techniques available.

31. Above the age of compulsory education, less than 100 per cent of each age group will be in school and for even the simplest global forecasts of total enrolment it is therefore necessary to apply « enrolment ratios » expressing the percentage of people of each age who are expected to be seeking education. Methods of estimating future enrolment ratios include the use of trend projections and international comparisons, and the straightforward setting of targets based on social, political or other criteria. The formulation of trend projections may, of course, be quite sophisticated, taking into account the socio-economic structure of the school population, its regional distribution, etc.

32. It is not, however, sufficient merely to make global projections of total enrolments for at least two quite separate reasons. In the first place, no educational system is fully « comprehensive » in the sense that all pupils have exactly the same educational experience while they are at school or university. Total enrolments are distributed amongst different types of school, different educational specialisations, different geographic regions, etc. To be useful, forecasts of enrolments must take account of these differences, and also of the movements of pupils between the different elements of the educational system at each age. Secondly, children themselves are not homogeneous. They enter the educational system from different environmental conditions and with different inherent abilities. As they pass through the different levels of the system, such differences are often magnified rather than diminished, both because the basic aim stated in paragraph 26 means that children with different abilities can benefit best from different educational experiences and because the structure of modern society and of modern knowledge is such that what is required is not simply « educated people, » but a wide range of people with different skills, talents, aptitudes and attitudes. Thus, while total enrolments are heavily influenced by demographic factors, the actual inflow of pupils into any particular branch of education is determined by a large number of other factors which exert an influence from both the input and the output sides[1].

A BASIC FORECASTING MODEL OF ENROLMENTS

33. Most children begin their full-time education with a period of legally compulsory attendance[2] which in modern societies is usually fairly well

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[1] The same conclusion holds even if the educational system is geared to diminishing the inherent and required differences between children rather than magnifying them.

[2] It is however, becoming increasingly common for children to enter school before they reach compulsory school age either for educational reasons or to permit their mothers to enter the labour force. Forecasts of their number depends on a variety of social factors, including, of course, the age of commencement of primary education.

enforced. As has been suggested above, therefore, prediction of total numbers in compulsory education is largely a matter of demographic forecasting. Four special reasons must, however, be mentioned which suggest that even for compulsory education, global forecasts of enrolments are not adequate.

a) Most countries permit pupils the opportunity of attending non-public schools if their parents wish it. While the educational planner is usually primarily interested in making estimates for the public sector, he cannot do so accurately without knowledge of the likely proportion of enrolments in the private sector. In addition, there is in some countries a transfer from the private to the public sector at certain points and also flows from the public to the private sector that might look like drop-outs, if they are not carefully observed.

b) Knowledge of the detailed geographic distribution of enrolments is vitally important at the compulsory school level. Children of these ages cannot be expected to travel great distances to school. The rate of growth of population and the proportions in different age groups are likely to differ in different geographical areas[1].

c) Decisions are made during the period of compulsory education, often quite early, which materially influence the career of the pupil when the period of legally compulsory education ends. Information about these decisions, which in practice means attendance at different types of institution, or entering different educational « streams » within an institution, is vital for forecasting developments in subsequent branches of the system.

d) In many educational systems pupils frequently « repeat grades which means that there is a greater concentration of pupils in the lower than higher grades. Apart from the importance of this phenomenon in itself from the point of view of the analysis of the efficiency of the system it has important implications for the type of teachers needed.

34. Another important factor affecting the number of pupils in compulsory education is the length of the period of compulsory education. It is difficult to state how assumptions about the future length of compulsory education should be made. It can, of course, be assumed that it will remain the same in the future as at present, unless specific political decisions to change the period of compulsory education have been or are likely to be made. Reasons why the educational planner may himself take the initiative in proposing a change in the period of compulsory education include :

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[1] The question of geographical breakdown of all estimates and plans is beginning to interest educational planners to a greater and greater extent as they move from general target setting to operational plans. This is not a field in which it is possible to make many general statements about appropriate detail in breakdowns, etc. This handbook is concerned with the global planning framework within which regional and local planning is likely to take place. It may, however, be remarked that the educational planner has a great need of detailed estimates of internal population movements, which hardly exist at present in most countries. In the context of compulsory education it may be noted that ideally demographic forecasts are needed for each existing and potential school catchment area. This probably necessitates considerable local participation in the planning process.

a) In order to set a period of compulsory education similar to that of other countries at equivalent stages of economic growth ;

b) In order to extend the educational opportunity of children from social groups who, for one reason or another, are not taking advantage of the educational facilities available ;

c) If it is believed that pupils leaving school at the end of compulsory education are inadequately prepared for labour-force participation ; or if, for other reasons, there is a lack of employment opportunities for school leavers.

35. After the end of compulsory education, it becomes much more difficult to predict the numbers of pupils in each branch of education. Apart from the obvious fact, previously mentioned, that it is no longer possible to use 100 per cent enrolment ratios and therefore, to rely mainly on demographic forecasts, there is the further complication that the educational system usually becomes much more complex. Private education is often relatively more important in the higher stages of secondary education. Furthermore, whereas the number of different streams and types of institution is usually quite limited in earlier education, at the more advanced stages, there are often a large number of different streams catering for different needs on the part of pupils. An important problem for the planner is to decide how many of these separate streams it is necessary to identify in detail. Another complication is the existence of part-time education[1]. All of these different options have different implications for the needs for teachers, building and finance in the public educational system, and effective planning requires reliable forecasts of the number of pupils likely to follow each stream.

36. The decision to follow a particular educational stream is not necessarily a final decision. As educational systems become more flexible, pupils move from one stream to another at different points in their career. Moreover, a stream at one level of the educational system may feed several streams at a higher level, and conversely one stream at a higher level may be fed by several streams from a lower level.

37. Many pupils leave school after the end of compulsory education and thereafter some leave each year, some having successfully completed courses, others not, until by the age of 30 very few people are still full-time students. Apart from the need to make estimates of school leavers at each age for his own purposes, the educational planner has some responsibility to make such estimates by age and by qualification for the benefit of economic planners who require information on potential new entrants to the labour force[2].

38. It is particularly important to have good estimates of the number of students who wish (and who have the required ability) to transfer from

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[1] In some countries a period of compulsory part-time education follows compulsory full-time education for those pupils who discontinue their full-time education at this point.

[2] Two important trends are worth noting in this connection. One, is the tendency for pupils to leave education for a year or more and then re-enter the system — often in connection with military service or similar activities. The second is the increasing importance of continuing education and training throughout adult life. Such «lifelong education» is becoming more and more formalised.

one branch of education to another at the important thresholds[1] of the system. Apart from the end of compulsory education, the most important of these is the move from secondary to higher education.

39. Estimates of future student numbers in any particular branch of education have usually been made on an ad hoc basis. If, for example, estimates of the likely number of entrants to universities are required, attempts are made to predict the number of secondary school leavers who will be qualified and seeking admission to universities[2]. Recent work, however, has concentrated on a more systematic approach, trying first to describe in quantitative terms the interrelationships between the various branches of education and then to use these as a basis for forward estimates. At its most ambitious, this may lead to the construction of a computable model of the whole educational system which can be used to :

i) Demonstrate how the educational system would be likely to develop, given no change in its present structure ;

ii) Show the likely effect of various policy decisions (e.g. to raise the compulsory school leaving age) on the number of pupils in each branch of education ;

iii) Determine how the educational system should be made to develop if specific targets are to be achieved in some future year[3].

40. The basic form of the model is the simple input-output matrix shown in Table I. In this table a number of branches of education have been distinguished from 1 to *r*. For the sake of exposition the first few branches of education (primary education, etc.) have been written in. The row totals of the matrix show the number of pupils in each branch of education in a particular year, say t_0. The column totals show the number of pupils in each branch of education in the following year, t_1. Since during the year, some children will enter the system, and some will leave, it is necessary to have a further row and column headed « outside education, » which may be further subdivided, if it is necessary to know where the entrants and leavers are coming from and going to. The rest of the cells of the table show how the stock of pupils of year t_0 is distributed in year t_1. Alternatively, it can be considered as showing whence the pupils of year t_1 came. The figures in the matrix are purely illustrative, and are intended

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[1] Or «filters», as they are sometimes called.

[2] Cf. «Report of the Committee on Higher Education» (Robbins Report) H.M.S.O. London 1963. See also, *Planning and Development of Higher Education in the United Kingdom : Some Statistical Problems*, by C.A. Moser, and P.R.G. Layard — Journal of the Royal Statistical Society, London 1964.

[3] Cf. *Education and Manpower : Some Current Research*, by C.A. Moser and P. Redfern, in *Models for Decision*, ed. D.W. Berners Lee (English Universities Press) 1965. The present section relies heavily on this paper and on a paper on *Educational Flow Statistics* submitted by P. Redfern to the OECD advisory group on pupil and teacher statistics March, 1965. Use has also been made of papers presented to OECD meeting on Mathematical Models in Educational Planning (March 1966), in particular.
A Mathematical Model of the Norwegian Educational System — A case Study, by Tore Thonstad.
Projection Models of the Swedish Educational System, by the Forecasting Institute of the Central Bureau of Statistics.
The Development of Computable Models of the British Educational System and Their Possible Uses, by Peter Armitage and Cyril Smith.

to help in interpreting it. To take the example of secondary general education, the interpretation is as follows : In year t_o, there were 300 pupils in this branch of education. By t_1 these were distributed as follows : 200 were still in secondary general education, 10 were in secondary vocational education, 40 were in other branches of education (here unspecified), and 50 had left the educational system. Similarly, to look at the table the other way, there were 312 secondary general pupils in t_1. Of these, 100 had come directly from primary school, 200 were already in secondary general education the previous year, 10 came from vocational education, and 2 came from outside the educational system (presumably re-entrants or immigrants). The matrix can be viewed in more general terms, if attention is directed towards the row heading « *r* » and the colum heading « s », it can be seen that the typical element in the matrix is the flow f $(r,s)t_o$. The row totals must equal the numbers of individuals in each branch of education at time t_o, i.e. $n(r)t_o$. The column totals must be the quantities $n(s)t_1$.

41. Interesting methodologically, are the 10 pupils who moved from vocational to general secondary education, and the 10 who moved the other way. Ordinary stock statistics (i.e. the row and column *totals*) would not record these movements at all, yet such transfers can be very interesting. Apart from the importance of distinguishing the various components of net changes in student numbers during a year, these cross flows reveal the importance of an integrated flow framework. Without such a framework, pupils who leave general schools to enter vocational schools are often recorded as dropouts, and thence « wastage » despite the fact that they have merely transferred to another branch of the system.

TABLE I. SUMMARY EXAMPLE OF FLOW TABULATION

Stocks of Students in years t_o and t_1 and flows occurring between the two points in time

ORIGIN t_o ↓ DESTINATION t_1 →	1	2	3	4	S	R	TOTAL IN t_o
1. Primary Education	800	100	50			50	1,000
2. General Secondary Education	0	200	10	40		50	300
3. Vocational Secondary Education	0	10	60	4		26	100
r.					$f(r,s)t_o$		$n(r)t_o$
R.	300	2	0				
Total in t_1	1,100	312	120		$n(s)t_1$		

42. It is, of course, possible and for most practical purposes essential to enlarge Table I considerably. In the first place, it is very useful to have the length of cycle of education represented by each row and column heading correspond to the period $t_1 - t_o$. In practice, since $t_1 - t_o$ usually represents a single school year, this means that the row (r) and column (s) headings should correspond to a single grade or year of study. If (r) and (s) represent an educational cycle of longer duration than the period $t_1 - t_o$, an unduly high proportion of pupils will be in the diagonal term, in which it will be impossible to distinguish course repeaters from normal promotions within

the branch of education. More important, however, a model based on such data will be of little more use than normal « stock » projections, since unless it can reasonably be assumed that each member of a particular cell has the same probability of going to any other particular cell, the different probabilities for individuals within the cell have a profound effect on the numerical results. Where a cell is an aggregation of pupils from several grades, it is quite clear that the probability of pupils successfully completing the course from the last grade is likely to have a positive value, whereas for all other grades it will be zero. Except in the case of a stable school population (or one in which the number of pupils in all grades is growing at the same constant rate), in order to predict successful completions accurately, it is necessary to know numbers in the last grade, the last grade but one, etc.[1].

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[1] A simple numerical example can make this point strikingly clear. The series of matrices below refer to a three-grade branch of education during four successive time periods. For an account of the forecasting procedures based on these flow matrices, see subsequent paragraphs.

CASE « A » : *Data by Grades Available*

t_0 ↓ t_1 →	GRADE 1	GRADE 2	GRADE 3	OUTSIDE EDUCATION	TOTAL t_0
Grade 1............	10	150	0	40	200
» 2............	0	10	130	10	150
» 3............	0	0	30	90	120
Outside education ..	200	0	0		200
Total t_1	210	160	160	140	(670)

t_1 ↓ t_2 →	1	2	3	0	TOTAL t_1
1	10.5	157.5	0	42	210
2	0	11	138	11	160
3	0	0	40	120	160
0	220	0	0		220
Total t_2	230.5	168.5	178	173	(750)

t_2 ↓ t_3 →	1	2	3	0	TOTAL t_2
1	12	173	0	45.5	230.5
2	0	12	144.5	12	168.5
3	0	0	44.5	133.5	178
0	240	0	0		240
Total t_3	252	185	189	191	(817)

t_3 ↓ t_4 →	1	2	3	0	TOTAL t_3
1	13	189	0	50	252
2	0	13	159	13	185
3	0	0	47	142	189
0	260	0	0		260
Total t_4	273	202	206	205	(886)

Case « B »

In this case information on the initial flows of pupils by grades is not known; otherwise the *initial situation* and the inflows during each year of the planning period are exactly the same.

t_0 ↓ t_1 →	E	O	TOTAL t_0
E	330	140	470
O	200		200
Total t_1	530	140	(670)

t_1 ↓ t_2 →	E	O	TOTAL t_1
E	371	159	530
O	220		220
Total t_2	591	159	(750)

t_2 ↓ t_3 →	E	O	TOTAL t_2
E	414	177	591
O	240		240
Total t_3	654	177	(831)

t_3 ↓ t_4 →	E	O	TOTAL t_3
E	458	196	654
O	260		260
Total t_4	718	196	(914)

E = Educational System.
O = Outside Educational System.

SUMMARY OF INFORMATION

TIME PERIOD	NEW ENTRANTS	TOTAL ENROLMENT	LEAVERS		
			GRADUATES FROM GRADES 1 AND 2	FROM GRADE 3	TOTAL
Case « A »					
t_1	200	530	50	90	140
t_2	220	577	53	120	173
t_3	240	626	57	134	191
t_4	260	681	63	142	205
Case « B »					
t_1	200	530	...	...	140
t_2	220	591	...	...	159
t_3	240	654	...	...	177
t_4	260	718	...	...	196

If, as is usual, forecasts are based on expected initial inputs into the system, all projections of pupil numbers, graduates, etc., are liable to substantial errors unless distinctions by grades are available.

43. The same need to make each cell contain as homogeneous a group of pupils as possible as far as their future possibilities are concerned, suggests that the classification scheme for the flow tabulation should also take account of a number of individual characteristics of pupils, sex, socio-economic background, innate ability, etc., since the transition coefficients are likely to be different for pupils with different characteristics under these headings. One difficulty is that these tabulations soon become very large. The basic model described by Redfern (op. cit.) if constructed would have had nearly 500,000 cells[1]. Where the individual characteristics are invariant with regard to time, (e.g. sex) or vary in a simple predictable way, (e.g. age), it is often most convenient to think of separate tabulations for pupils with each characteristic.

44. The need to assume the same probability for all pupils within one cell creates another problem in that it cannot be assumed, as the simple flow formulation described above does, that previous educational experience does not affect present probabilities for future performance. For example, a pupil who in arriving in a certain grade has previously repeated one or more grades may well have a set of future probabilities attached to him different from a pupil who has reached the same level without repeating. This problem can be dealt with conceptually in terms of second, third and higher order Markov chains[2]. In practice, this means that as well as tabulations showing the distribution of t_1 pupils in t_0, it is also necessary to obtain data on their distribution according to their activity at time t_{-1}, t_{-2}, etc. Clearly, this presents certain problems of data collection, though it can easily be handled with an individualised data system in which the links between the various years can be made automatically.

45. It is also likely that marks gained in earlier examinations are significantly related to a pupil's later transition probabilities ; for example, success in examinations for university entry is often correlated with marks obtained in examinations at the beginning of secondary school.

46. The tabulation of data on all these factors is likely to lead to matrices of unmanageable proportions. As has been suggested above, one way of dealing with this problem is separate matrices for each invariant characteristic of pupils. Another way of simplifying the tabulations is that, since nearly all the coefficients with non-zero values will be near the diagonal (it being very unlikely that primary school pupils will transfer directly to universities and vice-versa) certain educational processes can be split off for detailed examination while the rest of the matrix is very highly aggregated. For example, it is possible to consider in detail the various transitions between primary and secondary education, while the rest of the system is aggregated simply into « other education » and « outside education. » This is considered further in Chapter VII.

47. In order that the matrices may be used for forecasting, the absolute figures of Table I can be converted into a set of coefficients showing the proportions of pupils in one branch of education, who are in any other branch in the subsequent time period. The basic « transition coefficients »

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[1] Though a large proportion of the cells will contain zeros. It remains wasteful of computer capacity. See Armitage and Smith (op. cit.).

[2] See Thonstad (op. cit.)

are obtained by dividing each element of the matrix by the corresponding row total. Thus in terms of Table I, by dividing the elements of the matrix $f(r,s)t_0$ in each row r, we obtain the transition proportions $p(r,s)t_0$, i.e.

$$p\ (r,s)_{t_0} = \frac{f\ (r,s)_{t_0}}{n\ (r)_{t_0}}$$

These transition proportions show the proportions in which the individuals in process r at time t are redistributed between various processes during the unit period between time t_0 and t_1. The totals of the transition proportions for each row, of course, add up to 1 since the whereabouts of all the pupils or teachers of year t_0 has to be accounted for in year t_1.

48. Past data on flows between the different parts of the educational system can now be used in preparing projections of a part of, or the whole of the educational system. A soundly based projection can be made, using demographic forecasts of the initial inflow into the system, to which are applied the current values of, trends in, or likely developments of, the transition proportions. An integrated projection model of the whole educational system can be built up from the recurrence relationship :

$$n\ (s)_{t_1} = \Sigma\ n\ (r)_{t_0}\ .\ p\ (r,s)_{t_0}$$

where $n\ (s)_{t_1}$ = each column total

where $n\ (r)_{t_0}$ = each row total

$p\ (r,s)_{t_0}$ = relevant transition proportion.

Thus if numbers of pupils in each branch of education at time t_0 are given along with data on demographic trends and assumptions about transition proportions in subsequent time periods, numbers in each activity in later periods can be forecast.

TEACHER FLOWS

49. Similar techniques can be used for projecting numbers of teachers, though with some reservations. In the case of pupils the educational system can be considered as a fairly well defined system which pupils enter in a fairly steady flow, and within which they move, following a number of quite well-defined patterns determined by the structure of the system. Flows within the system are of relatively minor importance in the case of teachers and such movements as do take place do not follow a well-defined structural pattern. In the case of teacher flows, therefore, attention is devoted mainly to the teachers entering and leaving the profession and their reasons for doing so, whereas many of the most interesting pupil transfers are those within the system itself.

50. A further difference is that the values of the transition coefficients for teachers entering and leaving the profession are less likely to remain stable or to follow well defined trends. In the case of pupils, the transition proportions are unlikely to change sharply from one year to the next, because most of the fixed facilities remain intact, and new buildings are in most cases only a small proportion of existing capacity ; furthermore, pupil flows depend very much on the traditions and inherent propensities of the society. For example, if in year « t_0 » families wish to send 5 per cent of

their 18 year old children to university, they are unlikely to want, or be able, to send 10 per cent in year « t_1. » However, the proportion of, for example, university graduates who take up secondary school teaching, may be subject to many economic and educational policy influences that can change markedly from one year to the next.

51. Teacher flow « tabulations » remain, however, the most coherent way of showing the sources of supply of new teachers and the destination of those leaving the profession, thus permitting an analysis of teacher demand and supply problems, which are among the most important facing educational planners. In such a tabulation the row and column headings would correspond to the main sources of supply of teachers (e.g. teacher training colleges, universities, married women, other professional occupations) and the main destinations of those leaving the profession (retirement, marriage, other occupations, etc.). A summary of such a tabulation is shown in Table II. In this table, the area marked A would show those people who were pupils in period t_0 and also pupils in t_1. That marked B shows those who are teachers in t_0 and who have become pupils in t_1. C shows those outside the educational system in t_0, but who have become pupils by t_1. D are those people who are students in t_0 and teachers in t_1. E are those who are teachers in t_0 and t_1 (the figures within the sub-matrix will show movements of teachers between the different branches of education during the year). F shows those outside the educational system in t_0 who have become teachers in t_1. This part of the matrix is a very important feature of teacher supply estimates, showing as it does the number of married women who are returning to the profession, and the number of people who are being attracted into teaching from other professions. G shows those pupils who have left the educational system and who have not become teachers between t_0 and t_1. H is another important area of the matrix, it shows the number of teachers who left the profession over the year. I shows the number of people who were neither pupils nor teachers in both t_0 and t_1.

TABLE II. SUMMARY EXAMPLE OF TEACHER FLOW TABULATION

DESTINATION IN t_1 → ORIGIN IN t_0 ↓		1 2 3	4 5 6	7 8 9	TOTAL t_0
Pupils in primary and secondary education	1	A	D	G	
Pupils in teacher colleges	2				
Pupils in universities	3				
Teachers in primary and secondary education	4	B	E	H	
Teachers in teacher colleges	5				
Teachers in universities	6				
Other active labour force	7	C	F	I	
Other adult population	8				
Other population	9				
Total t_1					

52. This exercise reveals an interesting aspect of flow tabulations in general. Squares A, C, G and I are not directly used in calculating teacher supply of wastage. Without them, however, the estimation of transition proportions for those parts of the matrix in which we are interested would be rather difficult. And without the transition proportions of the complete matrix, it becomes extremely difficult to use the tabulation as the basis for a computable model of the type described in paragraph 48. It may be said to be a general rule of the type of flow matrices described in this chapter that they are best seen as a total system of « population flows » in which certain educational aspects are put under a microscope for much more detailed attention.

COMMENTS ON THE USE OF FLOW MATRICES

53. If the data are available, the mechanical use of these matrices of transition proportions for forecasting purposes is straightforward. It has been outlined in paragraph 48 above. In the examples that have been shown, the values of the transition coefficients have been assumed constant, but it is not much more difficult to incorporate trend changes in the transition coefficients, if data are available to estimate the trends. « However, this amounts to saying that we can forecast the future state of the system if we know accurately its present state and are prepared to assume what movements are going to take place over the period of interest... These calculations are possible because we are either given or have presumed everything we need to know and because the system is still highly simplified. This is no longer possible when the system is made more complex[1]. »

54. The important part of the exercise is that of making estimates of likely developments in the transition coefficients. This, at its simplest, is a four stage exercise.

a) The determination of which transitions are important, and the establishment of a system of classification and set of tabulations to enable these transition coefficients to be identified.

b) The estimation of their values in the base year.

c) Identifying the individual characteristics of pupils that affect the transition coefficients, and ascribing a numerical value to the influence of these characteristics, perhaps by using separate matrices for each individual characteristic. In principle, it is possible to identify an almost unlimited number of individual characteristics that may be important. The only limitations are practical ones.

d) Using the estimates of detailed transition coefficients for each homogeneous group of pupils derived from (c) above, to estimate probable developments in the global transition rates from forecasts of likely rates of growth of different socio-economic groups, urban and rural population, etc.

55. Some of the practical limitations on the degree of detail possible or desirable in identifying individual characteristics of pupils are outlined below:

a) The capacity of the computing facilities available. Even the largest modern electronic computers do not have unlimited capacity and a forecasting model which attempted to take account of the inter-relationships between all possible factors affecting transition coefficients would be very large indeed. There is also an administrative and economic constraint. Computer time is expensive and the addition of extra variables needs to be justified in terms of their likely effect in improving the forecasts.

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[1] Armitage and Smith (op. cit.).

b) The basic data which it is worthwhile to collect. Some of the information on individual pupil characteristics may be very difficult and costly to obtain ; for example, the relationships between distance from residence and educational institution, and educational attainment. In some cases, it is simply not justified. In others, one detailed survey may provide data which can be considered valid for a number of years. In fact, very few data on transition proportions are as yet available in most countries.

c) The degree to which the effect of a particular characteristic is likely to affect the results. For example, although the occupation of his parents is widely recognized as a factor influencing a child's educational decisions, there is unlikely to be much information gained by listing each individual occupation separately, since it is when occupational differences are wide enough to reflect broader social differences that they materially affect attitudes to education. It is however, necessary from time to time to conduct special surveys to obtain information on all possibly significant characteristics of at least a sample of pupils in order to decide which are, in fact the important ones.

d) The limits beyond which disaggregation is in any case not worthwhile. Unless the structure and dynamics of the components of the system are fully understood, there is no evidence that forecasts of trends in highly disaggregated components of a system will be more accurate than more aggregated projections. In addition, excessive disaggregation leads to such a small number of observations in each group that the estimates of probabilities within each group are heavily influenced by random disturbances. If, for example, there are only five persons in a particular group an atypical move by one of them will cause a 20 per cent error in the estimate of the transition coefficient for that group.

e) The possibility of making forecasts of the number of people with particular attributes. For example, if it is found that there are marked differences between rural and urban participation, for this information to be of any use for forecasting it is necessary to predict developments in urban and rural population.

56. A statistical tabulation scheme based on the preceding discussion would include the following components in the case of pupils :

a) Detailed and accurate information on inflows into the educational system. This means principally reliable demographic forecasts ;

b) Estimates of movements of pupils between grades and between different branches of education in successive years ;

c) Information, at least at the key transition points (e.g. completion of compulsory education, entry into higher education) on individual characteristics of pupils that are likely to affect their transition probabilities (socio-economic background, geographic location, intelligence or some measure of previous educational attainment, sex, age, and in some cases, race and religion) ;

d) On a more ad hoc basis, detailed studies would be undertaken to enable higher order Markov chains to be estimated[1] and also detailed analysis of factors that may affect transition probabilities.

57. In the case of teachers, attention would be concentrated more directly on the inflows and outflows and less on the flows within the system. A tabulation scheme would, therefore, be concerned primarily with :

a) sources of supply of new teachers by age, sex, educational background, previous occupation (e.g. teacher training colleges, universities, other occupations, married women, immigrants) ;
b) age, sex, marital status and type of teacher leaving the profession.
c) related information on factors affecting the relative attractiveness of the teaching profession (salaries of teachers, salaries in other professions, etc.).

58. In addition to statistics bearing upon the main behavioural characteristics of teachers and pupils, information would need to be collected on technological aspects of the educational system, that would be likely to affect transition coefficients, such as types of educational institution, size of institution, pupil/teacher ratios, expenditure per pupil on equipment, etc. In a comprehensive model, information on curricula, teaching aids, etc. would also be included.

59. Such a tabulation scheme would have a much wider application than merely providing a basis for the straightforward forecasting models that have been described so far. It would permit valuable insights into the operation of the educational system and it could be used for a variety of other planning purposes as well as forecasting, for example, as a basis for policies of increasing educational opportunity, guiding the educational system to meet certain output targets, analysis of repeating and dropout, etc.

CRITIQUE OF DEMAND FOR PLACES MODEL

60. This handbook is not the appropriate place for a detailed critique of educational planning methods, and the purpose of this section is merely to consider criticisms of the above methodology that might have implications for the collection of statistical data. Like all « methodologies of educational planning, » the approach has many conceptual weaknesses and is justified mainly by the consideration that some forward estimates must be made as a basis for decisions that will in any case be taken about schools and universities to be built, teachers to be trained, etc. Many of these decisions will have very long-term implications, and it is desirable to consider as accurately as possible their likely results.

61. The main criticism of the approach is that although it is purportedly based on estimate of the « demand for places » by individuals, what the data actually show is a mixture of demand for places, and supply of places or capacity available. This is seen most clearly in relation to the so-called « bottleneck » problem. In many cases the number of students who enter

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[1] See paragraph 44, above.

for example universities, or at least certain « restricted » faculties, is determined by the number of places available[1]. In this case, it is somewhat unrealistic to interpret the statistics of the numbers of students who enter universities as an indication of the demand for university places. There is little evidence that if more university places were available, there would not be enough students to fill them.

62. The situation is, however, even more complicated. Even if an attempt is made to measure the demand for university places by collecting information on the number of students who apply for these places, it is not at all clear that applications for entry to university are not influenced by students' own estimates of the number of places available. An additional complication caused, in part, by the bottleneck problem, is that transition coefficients cannot be considered independent of one another, since removal of a bottleneck at one point will have implications for a wide range of pupil choices. This increases the complexity of the basic research to be undertaken before such models can make their maximum contribution to forecasting and planning.

63. Criticisms are also possible from a broader social viewpoint. In most modern educational systems, education is supplied to individuals free, or at least much below its real costs to the community. Demand in this case does not have the same connotations that it normally has in economics. This is particularly relevant in cases where students receive financial grants which can be used explicitly or implicitly to influence individual demand, by encouraging students either to remain in the educational system when they might otherwise leave, or to enter institutions or specialised courses when, given no financial incentives, they might prefer others. One answer to these criticisms is that they apply equally to most traditional methods of forecasting demand for places by students, only in the absence of a comprehensive descriptive model they are not recognised.

64. It is not necessary to regard Table I as indicating anything very profound about the demand for places in educational institutions, but rather as a convenient descriptive formulation of the basic dynamics of the educational system, just as statistics of the number of pupils and teachers at a point in time can give a reasonable picture of the static situation of the system. The analytical framework can be used in a variety of ways of which the simple prediction model outlined in this chapter is only a first step. The ultimate objective will be to develop planning models which are part of the decision making structure itself in such a way that there is continuous feedback between the projections of the model and the actual decisions and actual developments in the real world[2].

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[1] Even in cases where entry to universities is apparently open to all who qualify, there are reasons to suppose that apparently objective qualification standards are not unrelated to the number of places available.

[2] For initial thoughts on such developments, see *The Introduction of Control Concepts in Educational Planning* by Paul Alper, and Armitage and Smith (op. cit.) in *Mathematical Models in Educational Planning*, OECD 1966.

Chapter III

SOCIOLOGICAL ASPECTS OF EDUCATIONAL PLANNING

EARLIER CONTRIBUTIONS OF SOCIAL SCIENTISTS

65. The purpose of this chapter is to develop a strategy for incorporating data on the socio-economic characteristics of pupils and students into the basic scheme of information processing and analysis proposed in the handbook.

66. The first step in the development of such a strategy is to give recognition to the numerous investigations carried out by social scientists on educational participation of diverse elements in the population such as social classes, occupational groups or ethnic and linguistic groups. Almost thirty years ago, the earliest of these studies, dealing primarily with the social origins of university students, were summarized in a well-known book dealing with general patterns of social differentiation in modern societies[1]. Since then, the studies have multiplied in number, improved in techniques of analysis, and widened in scope to include far more of the total educational system than its highest reaches at the university level. Many summaries of the recent investigations are available, of which one was prepared under OECD auspices[2].

67. As a result of the wealth of research documenting the unequal chances of various socio-economic groups to achieve advanced levels of education, a rough working knowledge is now available for very many societies of the basic facts of diversity in educational opportunity and participation. It is relatively easy, in other words, to generate a list of social status attributes of children and youth which are almost certain to affect their likelihood of attaining more than the legally required amounts of schooling. Such a list includes such attributes as sex, father's occupation, parental educational status, family income, place of residence, racial, ethnic and religious affiliation. This list of attributes represents a summarizing of all of the factors consistently showing high correlations with educational attainment in research carried out by social scientists.

68. However, these investigations represent only a first step in what will undoubtedly prove to be a long sequence of stages directed towards providing

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[1] Pitirim Sorokin, *Social Mobility*, 1927.

[2] See A.H. Halsey, *Ability and Educational Opportunity* (OECD, 1961). See also A.H. Halsey, Jean Floud and C. Arnold Anderson in *Education, Economy and Society*, New York, The Free Press of Glencoe, 1961.

information of direct relevance for educational planning and policy. With few exceptions the studies so far have been undertaken by university affiliated social scientists who have worked with limited resources of money and personnel, and who have been obliged to make compromises in the design and execution of their research. They are, for the most part, studies of only parts of the youthful population, or of only parts of the educational system, or both. Because the studies are so limited, it would be difficult to formulate educational policies on the basis of their results, since what is true of one segment of the population — one region of the country, let us say, or secondary school students, or urban children only — may not be true of the remainder of the population.

69. But the knowledge gained thus far is inadequate for planning and policy making in other ways. It is towards an improvement in these respects that the next step in the strategy should be directed.

A Research Strategy

70. Let us call the list of social status attributes of children and youth suggested above a set of independent variables, since the way in which children vary with regard to socio-economic origins, racial and religious, and residential status, is presumably due to a complex set of structural features of society outside of, and independent of the school system. Let us then delineate a set of dependent variables, consisting of, in principle, an exhaustive list of all the ways in which children differ in their performance, behaviour, decisions and preferences and capacities within the school system. It is this set of variables to which greatest attention has been given in the previous chapter, for it is the inter-relations among them that will be established systematically through the pupil flow matrices and the transition coefficient derivable from the the matrices. What is new here is to see the pupil flow matrices and the coefficients describing the likelihood of moving from one educational status to another, as themselves a part of a larger analytic scheme.

71. While there can be no doubt that pupil flow matrices represent a powerful analytic tool for observing and analysing the behaviour of children and youth in the educational system, and for making accurate predictions about the output of the system, it does not follow that they are the best choice if one is looking for an analytic technique to examine the behaviour of children and youth in schools. The shift in the problem is a major change in emphasis, and it should lead to an examination of a wider set of methods of data collection and analysis. There need however be no opposition between these two starting points for planning, and the way social data can be used for projections is outlined later in this chapter.

72. By disengaging the behaviour of children and youth in the educational system from the method of constructing pupil flow matrices, it should be possible to develop a strategy for handling the following type of problem: what is the most appropriate manner for examining the diversity of educational behaviour and choices of children from unlike social and cultural backgrounds, if such examinations are to have a direct bearing on the formulation of educational plans and policies?

73. The problem is one of finding a procedure for relating the independent variables — such as sex, occupational origins, residential location, and so on — to the dependent variables — rate of progress through the grades, school marks, choice of specialised courses, and the level of schooling reached at the time of dropping out — in such a way as to enable educational planners to derive the greatest benefit from the results.

PRELIMINARY STUDIES NECESSARY

74. Starting from this broad formulation, a number of specific proposals can be made for data collection and analysis in which socio-economic characteristics of children and youth are a central focus.

75. The compiling, on a routine basis, of information on the distribution of children of pre-school age by the major social characteristics of their families — such as occupational status, family income, religious and ethnic status, and place of residence. It is an almost hopelessly difficult task, given the present status and quality of official statistics, to describe the child population of virtually any modern society in these terms. While it should be part of the statistical material readily available to the educational planner, at present such basic information must either be put together by intelligent guesses applied to shaky data, or estimated from occasional surveys of differential fertility rates by occupation of the father or other equally unsatisfactory methods. Later in this volume, it is anticipated that information on the social characteristics of children will become available when individualised data systems are developed for keeping track of pupils and students. However there is no reason why the distributions of numbers of children by the social statuses of their families should not be available to the planner years before the children arrive at school. In large part, this is a proposal for improving the quality and quantity of information already collected in connection with records of vital statistics. In some cases, it may involve nothing more than retabulating data on number of births in accordance with the needs of the school system, if information on father's occupation and on religious and ethnic status are already collected. Another source of information is the periodic national population census, from which it is in principle, though seldom in practice, possible to derive detailed distributions of all children by the characteristics of their parents. Published census tables rarely give this type of information, but they can be far more fully exploited than is the current practice to give the educational planner the basic data on how many children there are among the school system's potential clientele from the various types of social backgrounds found in his society.

76. It is important that such basic statistics on the child population be collected at rather frequent intervals, preferably every year. At least three major social trends, characteristic of most advanced societies, have a major effect on year-to-year changes in the proportion of children born into families which differ in the social statuses known to have a direct bearing on educational performance and achievement. First, the urbanisation of the population, brought about by net migration from rural to urban areas and by the growth of smaller communities into large towns implies that there occur steady increases in the relative number of children born in cities, rather than in rural areas. Second, changes in the occupational structure

lead to ever-growing numbers of adults in white collar, technical, professional and similar parts of the occupational structure, at the expense of the relative proportions both in unskilled manual work and in agriculture. More and more children, proportionately, are born into families in which the household head is a non-manual, non-agricultural worker, because an ever-increasing proportion of the labour force is occupied in such economic activities. Third, fertility rates have shown a general tendency towards greater uniformity among the diverse social, cultural and occupational groups in modern societies. While it was formerly the case that the children of workers and of farmers were over-represented in the child population, relative to the number of adults in these categories, and the children of white collar and professionals under-represented, such disparities are decreasing.

77. As a result of the three social trends, children of urban white-collar families represent an increasing proportion of the total child population. Since the propensity to attain the higher levels of education appears everywhere to be at its maximum in urban families of non-manual occupational status, it is of considerable relevance to the task of the educational planner to have reliable information on the gradual shift toward larger proportions of children who are reasonably certain to remain in school longer than what is, at the moment, the typical or average length of time. It may well be the case that these trends are in large part responsible for the very noticeable increase in demand for secondary and higher education occurring at the present time. Until the effect of such trends on the changing social composition of the child population is documented, they will remain undetected despite their significance.

78. To summarise, the first proposal is that every effort be made to develop a data reporting system which will provide accurate and up-to-date social baseline statistics describing the future school population with respect to what have here been termed the « independent variables » — that is, the major social, economic and cultural statuses in the social structure that prevails in the particular society.

A MULTIVARIATE ANALYSIS OF FACTORS AFFECTING EDUCATIONAL PARTICIPATION

79. The second proposal consists of a direct attack on the problem of examining the relations currently found in the particular society between its social structure, as expressed in the diversity of status occupied by its children and youth, and its educational system, as expressed by the highly diverse ways that children and youth progress in the lower and higher parts of the school ladder. The idea is as follow :

a) To collect « stock statistics », that is, comprehensive information referring to one point in time, about the full range of social background characteristics and the full range of data on educational status (length, branch and type of schooling, examinations passed, and so on) for the school-age population, including those who have left school.

b) To subject the data on social background characteristics and educational performance and behaviour to a complex multivariate analysis, using the powerful techniques currently available in social research[1].

80. The fundamental idea of the analytic models is that they require the investigator to specify in advance a series of alternative hypotheses as to how all possible combinations of a set of independent variables may account for the variance in the dependent variables, and that they then provide an objective test of which of the hypotheses is most correct. It is perhaps useful to provide a few examples of the type of information a multivariate analysis might. (In the following examples, the facts presented are imaginary, although derived from a few clues available in the research literature; it is the form in which the results are presented that the illustrations are intended to convey.)

1. Of the total variance in educational attainment among boys, equal amounts are accounted for by the occupation of the father and by the boys' school grades. But among girls, far more of the variance in educational attainment is accounted for by the occupation of the father than by the girl's school grades. For prediction purposes, in other words, school grades are more significant in forecasting the final educational attainment of boys than of girls. For planning purposes, such a result would inform the educational policy-maker that girls and their families make less use of the evaluations of the girl's own capabilities made by the school when deciding on how much or what type of education she will be given, and perhaps decide on schooling for girls in a less individualized, more « stereotyped » manner than is the case for boys. Note that this is a far more adequate and concrete statement concerning sex differences in educational attainment than the blanket statement that while x per cent of boys complete secondary school, only x—y per cent of girls do so. By introducing further variables into the analysis, it provides clues as to what the underlying processes are that result in lower educational attainment of girls, and thereby gives the educational planner added purchase in developing corrective measures to the extent they are considered desirable.
2. While the total or zero-order correlation between level or type of highest educational attainment and father's occupation is, let us say, of the order of 0.7, the partial correlation between educational attainment and paternal occupation, holding constant the size of the community of residence, may be no more than 0.4. The relations among the three variables — level of schooling, father's occupation, and place of residence — can also be specified in another way. The zero-order correlation between place of residence and level of schooling may be of the order of 0.6, while the partial correlation between place of residence and level of schooling, holding constant paternal occupation, may be no more than 0.2.

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[1] See, for example, P.F. Lazarsfeld and M. Rosenberg in, *The Language of Social Research*, Glencoe, Free Press Publishers, 1955. Also, *Mathematical Thinking in the Social Sciences*; and Hubert Blalock, *Social Statistics*. For an excellent recent example of the use of multivariate analysis to investigate relationships between socio-economic characteristics and educational participation see *Equality of Educational Opportunity*. U.S. Office of Education. Washington D.C. 1966.

81. This type of statement exemplifies the way in which the proposed multivariate analysis represents a distinct advance over the state of knowledge now prevailing with regard to the social bases of unequal educational participation. At the present time, it is well known that children and youth of diverse social origins, defined according to father's occupation, differ in level of education attained. Also for many societies, it has been documented that community of residence, particularly when classified according to level of urbanization, also affects educational attainment. But only in rare cases has the problem been attacked of how these two contingencies affect educational attainment when they are considered *jointly*, rather than one at a time. If an educational planner were to devote serious attention to decreasing socially based inequalities in educational attainment, he would at the least want to know whether the prevailing differences among villages, small towns and cities, on the one hand, and among children from different occupational origins, on the other, represented two totally unrelated sources of inequality, or whether they overlapped to a greater or lesser degree as sources of inequality. It is precisely this sort of question which a systematic multivariate analysis is designed to answer.

82. As the examples suggest, the purpose of the multivariate analysis is to establish how the behaviour of children and youth in the educational system, varying as it does in rate of progress, type of schooling chosen, and highest level attained, is accounted for by the social, economic, geographic, cultural, and social status of children and youth as determined by the prevailing social structure. The analytic models developed in social research seem to be capable of defining these relationships both precisely and concretely, so as to give educational planners workable knowledge as to where and how prevailing inequalities in educational opportunities may be attacked with the greatest chance of being effective.

83. It is proposed here that such an analysis be applied to a comprehensive battery of data collected through a survey or census of the population of school age, including children and youth of the appropriate ages who have left the school system. It is necessary to include children and youth outside the school system in order to be able to establish the *proportions*, as opposed to the absolute *numbers*, who continue in school beyond compulsory education.

84. A variety of sources and methods will be needed in order to collect the full battery of information. For children and youth still connected with the school system, records maintained by schools can be exploited with relative ease, to some extent in conjunction with the programme of data collection envisaged for preparing the pupil-flow tabulations. Quite independently of the schools, the population censuses of 1970 or 1971 can provide a good deal of the data called for by the proposed research design. From population census data, a great deal of information about children and youth, whether in or out of school, can be derived, and information about the social status of their families can be attached to information about the educational behaviour of the offspring. In the long run analysis of the progress of cohorts of pupils coming from different backgrounds could be possible.

85. There is, however, one part of the youthful population which will undoubtedly be less accessible to any of the usual sources of information,

and in connection with which unconventional and imaginative methods of data collection will have to be devised. These are the young adults, approximately of ages 18-25, corresponding to the ages of university and professional studies, who are no longer in the school system. A good number of these young people no longer live with their parents, but have moved on to establish independent residences either before or at the time of their own marriage. While their current location and educational attainment can be established with the help of population census data, it will be difficult to link the information concerning these independent young adults with their family background characteristics. Perhaps the only way to come to terms with this problem is with the help of special sample surveys confined to this limited segment of the population.

Basic Data Requirements

66. There follows a list of the basic types of data required for the multivariate analysis. The specific items mentioned may not, in all cases, be easily obtainable but at least those with highest priority (listed first in order) should be most accessible and, at the same time, most deserving of special efforts to collect because of their proved salience in the analysis of educational attainment.

FAMILIAL STATUS	PERSONAL STATUS	SITUATION IN THE SCHOOL SYSTEM
Fathers' occupation	Age	Grade in school (or highest grade of studies completed)
Size and type of community of residence	Sex	Type of specialization in secondary school and university
Father's education	Intelligence	School marks in current or last completed grade
Mother's education		
Family income	Birth order in family	Characteristics of schools attended (socio-economic composition of the pupils, size of school, etc.)
Size of family		
Religion, ethnic or racial status		

67. The results of the type of multivariate analysis outlined here would consist of a set of quantitative measures, in the form of partial and multiple correlation coefficients, analyses of variance and regression equations, of the inter-relations of social status variables and educational variables. As the examples given earlier suggest, such results should prove of direct value to educational planners insofar as they concern themselves with policy problems connected with unequal participation in education by children and youth of unlike social backgrounds. At the same time, the results of the multivariate analysis would in turn represent a starting point for further types of data collection and tabulation. In other words, the multivariate

analysis is not intended as the final form, but rather as a preliminary stage in the fully developed strategy being outlined here.

Integration of the Multivariate Analysis Results with the Flow Tabulations

88. This step concerns the integration of the results of the multivariate analysis with the basic pupil flow tabulations treated in detail in chapter II. In that chapter, while it was recommended that individual pupil characteristics in principle, be handled within the pupil flow matrices, in order to improve their predictive power, it was suggested that to do so would lead to tables so large and of such an order of complexity as to strain the capacity of electronic computers. This is indeed the case, provided one attempts to allow for every possible combination of an exhaustive list of individual pupil attributes — as, for example, all combinations of the eleven familial and personal statuses in the chart above.

89. The results of the multivariate analysis, however, will permit a way out of the dilemma of having to choose between the shotgun approach of including all combination of all pupil characteristics, and of including none of them at all. For the multivariate analysis will indicate *which* particular combinations of the pupils' personal and familial statuses are most highly correlated with the rate and the character of pupils' progress through the educational system. It will provide a rank order of status variables, according to their power to account for variation in educational attainment. It will then be possible to choose a limited number of individual pupil characteristics to be handled within the pupil flow tabulations, and to do so with the certainty that these few will increase the predictive value of the tabulations to a greater degree than any other of the possible combinations of pupil characteristics.

90. It is well to recall at this point the first proposal of this chapter to establish, on a yearly basis, estimates of the number of children later to enter the school system distributed according to their socio-economic, residential and cultural status. This will provide the educational planner with a set of *weights* that can be attached to the *differential* transition coefficients defining the probability that pupils of specified social statuses will attain different levels and types of schooling. He will then be in a position to predict the future output of the educational system with far more accuracy than can be achieved with transition coefficients for the aggregate of an age cohort.

A Diffusion Model of the Educational Process

91. One of the fundamental properties of the current educational revolution now occurring in so many countries is that many large social categories in the population who never previously identified themselves with higher academic, technical, or professional education are now beginning to do so. At least the beginnings can be seen of an interest on the part of farmers, workers, and similar groups in educating their children beyond the compulsory level. This suggests that an interest in education is under *diffusion*, spreading out from the groups in which participation in higher education has traditionally centred to ever larger segments of society.

92. Theoretical models of diffusion processes represent one of the most interesting and promising developments in modern social research. Stemming from the observations of field anthropologists concerning the spread of cultural elements from one primitive community to another, studies of diffusion have become more and more systematic and given rise to explicit models for tracing the course and speed with which information, ideas and innovations move through identifiable points in a system.

93. To construct a diffusion model for the adaptation of new orientations to education, it will be necessary to specify the major parameters both of the types of behaviour which are under diffusion and of the structure in which the diffusion is occurring[1]. In large measure, these two sets of parameters correspond to the « dependent variables » and the « independent variables » respectively, as these have been defined previously. Other parameters would, in principle, be of value in an educational diffusion model, particularly those having to do with channels of information and with barriers in communication of messages concerning educational opportunities. But in any event, there is no doubt that the knowledge derived from the multivariate analysis of the interaction between status in the social structure and behaviour in the educational system would be of direct benefit to the eventual construction of an educational diffusion model.

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[1] For a systematic discussion of these two aspects of diffusion models, see James S. Coleman, *Introduction to Mathematical Sociology*, The Free Press, 1964. Several excellent and imaginative examples of models of similar complex social processes are given in William McPhee, *Formal Theories of Mass Behaviour*. A similar model taken from epidemiology is proposed by R. Stone in *A model of the Educational System* (Minerva Winter 1965).

Chapter IV

MANPOWER REQUIREMENTS

Reasons for Estimating Manpower Needs as a Basis for Educational Planning

94. The demand for places approach to educational planning uses as its starting point the input into the various branches of the educational system. The manpower approach starts with the required outputs. Just as the previous chapter considered, therefore, the factors affecting the *inputs* into the various branches of education — demographic factors, socio-economic factors, job opportunities, policy decisions, etc. — so the present chapter must investigate the factors affecting the required outputs of the system. As in the previous chapter the main features of « demand » for places models were only briefly outlined to provide the basis for proposals on statistical needs, so this chapter merely indicates the main lines of the manpower forecasting approach to educational planning.

95. A problem that has worried economists ever since they have become interested in education is that educational output cannot be very well defined much less measured in education. This makes it difficult to analyse cost/benefit relationships. Various attempts have indeed been made to measure the economic output of education ranging from the measurement of the earnings differential between educated and uneducated people, to assuming that the part of economic growth that cannot be statistically « explained » in terms of growth in the capital stock and increase in the labour force is due in some measure to education[1]. Whatever the intellectual merits and demerits of these different attempts to measure educational output, most of them have not proved very useful in providing policy makers with the information that will help them decide how much of the available resources to devote to education ; and how to distribute these between the various levels and types of education.

96. The manpower approach to educational planning does not attempt to deal directly with the problem of defining or measuring educational output. It is concerned simply with one aspect of educational output, the skills, talents, aptitudes and attitudes with which education can provide the future working population. The « Rationale for according manpower forecasts a prominent role in assessing educational needs is perfectly straightforward. It runs something like this : a nation with plans or aspirations

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[1] For a summary and evaluation of different attempts at estimating the economic output of education see *Assessing the Economic Contribution of Education : an Appraisal of Alternative Approaches*, by William G. Bowen in *Economic Aspects of Higher Education*, Ed. S. Harris (OECD) Paris 1964.

for economic development cannot afford to slight the preparation of its human agents of production. The creation of a new steel works, for example, is meaningless unless provision is also made for the scientists, engineers, managers, skilled workers, clerical staff, etc. necessary to operate it. Since one of the functions of an educational system in society is to provide its work force with the abilities required for productive activity, it follows that the system must be reasonably well geared to the production requirements of the economy. Moreover it is the *future patterns of* requirements that must guide today's educational decisions. The reason is that the « lead time » in producing qualified manpower is exceptionally long[1]. »

97. One of the basic difficulties of this approach to educational planning is to interpret the meaning of « requirements. » In the simplest sense manpower « requirements » are interpreted as meaning that there are fixed relationships between various types of manpower inputs and economic output. Carrying it a stage further this means that there is a somewhat rigid complementarity between physical capital inputs and qualified manpower inputs, and also between the inputs of different types of qualified manpower. Clearly this narrow interpretation is open to criticism. In the first place, many types of qualified manpower are only remotely connected with physical outputs. It would be difficult, for example, to show how gross national product would be affected if there were a thousand more or fewer lawyers[2]. In the second place, even in production sectors some substitution between different qualifications is clearly possible. This may mean that a particular function (e.g. administration) can equally well be performed by people with various different qualifications, or that different functions can themselves be combined in different ways to give the same output[3].

98. A further difficulty in forecasting manpower requirements particularly in economically advanced countries is to predict the effects of technological progress. Although some progress is being made[4], it remains extremely difficult to foresee the effects of such developments on manpower needs a decade or more hence. In many cases the new technology creates new occupations. It is safe to say that no manpower forecasts that might have been made in the early 1950's in North America or Europe could possibly have foreseen the phenomenal demand for a whole range of skills associated with computer technology a decade later. Of the various groups with whom the educational planner must associate closely, among the most important are those whose concern is forecasting technological developments. Because of the uncertainties of technological progress, if for no other reason, manpower forecasting is likely to remain an art rather than a precise science ; which does not, however, mean that quantitative techniques have an unimportant role.

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[1] *Manpower Analysis in Educational Planning* by H.S. Parnes in *Planning Education for Economic and Social Development*, ed. Parnes (OECD 1963). This chapter leans heavily on the work of Parnes and on the *Technical Evaluation of the Mediterranean Regional Project*, by R.G. Hollister (OECD 1966).

[2] The fact that highly qualified manpower is often concentrated in service sectors aggravates this problem.

[3] For a useful discussion and some empirical evidence see *The Utilisation of Educated Manpower in Industry*, by M. Blaug and M.H. Peston and A. Ziderman, Chapman & Hall (London, 1966).

[4] See, for example, *Technological Forecasting in Perspective*, by Erich Jantsch, OECD Document DAS/SPR/66.12, Paris, October 1966.

99. In the present state of the art of manpower and educational planning, therefore, it is probably more useful to think in terms of educational output « targets » than of manpower « requirements » rigidly based on a desired rate of national income growth[1]. For some occupations, certainly, and for some educational qualifications, these targets may be interpreted as showing the amount of certain types of manpower that should be forthcoming if certain specific production targets are to be met. In other cases, educational output targets will be much more loosely linked to general economic and social aspirations — so many doctors per head of the population, etc. The art of manpower forecasting for educational planning is to find reasonable and generally acceptable bases for the establishment of targets. Clearly such an approach is in many ways not as intellectually satisfying as the attempt to establish manpower « requirements » linked directly to certain GNP growth targets. It is, however, more realistic. Public debate about the reasonableness or otherwise of the targets is as important a part of the educational planning exercise as the calculation of sophisticated forecasting coefficients[2].

THE ESTABLISHMENT OF EDUCATIONAL OUTPUT TARGETS

100. The best way of setting targets for educational output is still the subject of considerable debate. One of the most straightforward is that adopted in the OECD Mediterranean Regional Project[3]. The methodology consists roughly of the following steps:

i) Estimates of total output of the economy — since the logic of the manpower requirements approach is to link the targets of the educational system to those of the economic system, the starting point of the planning exercise must be the establishment of estimates of the target levels of total output in the economy — usually stated in terms of Gross Domestic Product (GDP) or Gross National Product (GNP).

ii) Estimates of sectoral output — since it is generally felt that the changing structure of the economy as well as the level of activity is likely to have an effect on manpower and, therefore, educational requirements, the second step is to estimate the division of the total output among various sectors of the economy in the target year.

iii) Estimates of inverse sectoral labour productivity. In order to link the level and structure of output to the labour force it is necessary to develop estimates of the inverse of sectoral labour productivity, i.e. the number of persons employed per unit of output in the sector. When these estimates are multiplied by the appropriate sectoral output estimate from step 2, the resultant is an estimate of the number of workers required in each sector of the economy in the target year.

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[1] Although some of the standard authors on the subject (e.g. Parnes and Harbison) use the term manpower requirements occasionally a close reading of their work clearly reveals they are using the term in the rather loose sense indicated in this paragraph.

[2] For a useful technical discussion of this subject see Armitage and Smith (op. cit.).

[3] An attempt by planning authorities in Greece, Italy, Portugal, Spain, Turkey and Yugoslavia, to establish with technical assistance from the OECD, educational plans based on the establishment of manpower targets. Much of this chapter is based on the methodology of the MRP as set out in *Forecasting Educational Needs for Economic and Social Development*, by H.S. Parnes (OECD, 1962) and *Technical Evaluation of the Mediterranean Regional Project*, by R. Hollister (OECD, 1966).

(iv) Estimates of the sectoral occupational distribution. It is supposed that different types of labour will have to have different types of educational background and, therefore, it is necessary to estimate the number of workers required according to occupation. In order to do this, estimates are formed of the occupational distribution of the labour force within each sector. Multiplying these estimates by the estimates of the number of workers required in each sector, as arrived at in step 3, will give the numbers of workers required in each occupation in each sector of the economy.

(v) Estimates of the total occupational distribution. In this step, the numbers in a given occupation in each sector are added up for all sectors in order to arrive at an estimate of the total number of workers in that occupation required in order to reach the targets of total output.

(vi) Estimates of the education associated with occupation. In order to convert the occupational estimates into target estimates of the educational stock in the labour force, estimates must be developed of the kinds of education which are to be associated with each occupation. Multiplying these estimates by the estimate of the numbers required in each occupation gives the number with each kind of education in each occupation.

(vii) Estimates of the total educational stock. In this step the estimates derived in step 6 are added up over all occupations for each education level. The resultant figures give estimates of the required stock of the number of workers in the labour force having each type of education.

(viii) Estimates of the increment of manpower by education. To convert the estimates of target educational stock into flow estimates, it is necessary to subtract from the estimates of the target stock the number of those already in the labour force, with each education level, who are expected to survive until the target year. This gives an estimate of the increment of manpower by education category which it will be necessary to add to the labour force over the period of the plan.

(ix) Estimates of the total graduate flow. Since a portion of the graduates of the educational system do not enter the labour force, the increment of manpower by education category must be multiplied by estimates of the inverse of labour force participation rates of each graduates. The resultant figures will represent the final estimates of the required total flow of graduates over the period of the plan[1].

VARIANTS OF THE BASIC METHODOLOGY

111. This statistical handbook is not the place to discuss in detail all the variations of this basic approach. The aim is rather to provide data that

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[1] R.G. Hollister (op. cit.)

will be useful for a wide range of methodologies and provide a basis for the necessary research associated with each. Four important variations are, however, widely discussed.

i) The possibility of omitting the step of estimating occupational requirements and moving directly from the estimates of output and productivity by sector to estimates of the different educational qualifications needed to produce that output at that productivity level[1]. This is based mainly on the belief that at present many occupations are ill defined and the attempt to estimate occupational requirements requires considerable efforts and yields little or no improvements in the forecasts. It can also be held that education makes a direct contribution to output, and not via the occupation that a person with a particular qualification happens to perform. In the present state of knowledge it would appear as if the detour via the occupational structure is to be preferred because it constitutes the common denominator between the economy on the one hand and education and training on the other.

ii) It has been claimed that the calculation of occupational structures in each branch of activity can best proceed by estimating and projecting partial productivity coefficients of each occupation and then estimating directly from output figures the occupational structure of each branch of activity rather than proceeding via overall employment estimates.

iii) Another view is that instead of estimating the entire educational structure of some target year it is preferable to estimate the acquired qualifications of only the new entrants to the labour force in each year of the planning period[2]. This is based partly on the assumption that the extra output of each future year would be produced from new investment which would use the most advanced techniques available and would require the occupational/educational structures associated with these techniques and partly from the fact that nearly all the new entrants into the labour force will come almost directly from the educational system and members of the existing labour force will not be in a position to be exposed to any education or training during *the planning period*[3]. It has been claimed that only the first occupation of individuals after leaving school or university should be studied in setting educational targets.

iv) Possibly most common are ad hoc forecasts of individual occupations which are thought likely to create bottlenecks to growth or for which required educational qualifications are very specific. Thus special forecasts are made for doctors, teachers, etc. Usually this method is used simply to estimate the needs of a particular occupational group with no consideration of its implications for the rest of the educational system. However, to the extent that it is used in overall educational planning the justification would be that in occupations for which educational needs are not specific, the exact orientation of the educational system does not much matter and for those that are unlikely to prove bottlenecks to economic growth it is better to leave the determination of output to individual demands to study these subjects.

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[1] Cf. J. Tinbergen and H.C. Bos in *Econometric Models of Education*, OECD (Paris, 1965).
Also G. Bombach, *Forecasting Requirements for Highly Qualified Manpower as a Basis for Educational Policy*, OECD mimeographed document DAS/EID/63.86. Bombach experimented with both hypotheses and concluded that the detour via occupations was preferable.

[2] Cf. *Investment in Education*. Report of the Irish EIP Team (OECD, 1966).

[3] Though the spread of adult education of various kinds is making this less true.

METHODS OF ESTIMATING FUTURE VALUES OF QUALIFIED MANPOWER COMPONENTS

a) *Occupational Forecasts*

112. The present section considers methods by which target estimates of future occupational and educational needs can be made. It should be admitted that much of the existing work gives inconclusive results and any attempt to estimate qualified manpower needs should be considered as fundamental research, and as a contribution to knowledge of the subject as much as practical preparation for any particular educational planning exercise.

113. It is assumed here that total employment figures and output figures by branch of economic activity are provided to the educational planner by the economic planning authorities[1].

114. One very straightforward method of estimating occupational needs[2] is to project the trends over a number of years in the occupational structure in each branch of activity. Sometimes the proportion of the total labour force in each occupation is projected, and in other cases the total number in each occupation has been related directly to output. Unfortunately, very few countries have sufficient data at the present time to make such calculations, and no countries have sufficient data for reliable regression analysis of time series. Eventually, this situation will be rectified as a result of the amount of manpower forecasting that is currently being undertaken in a large number of countries, but it is likely to be many years before sufficient data will have been generated to test the validity of such trend estimates. One particular danger with this method is the likelihood in many cases of projecting « non-optimum » situations since there are often strong reasons for supposing that the base period situation is itself not an optimum.

115. Another technique that has been quite widely used is that of simply taking as a pattern for some future date the current occupational structure of one or a number of other countries considered to have suitable economic

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[1] For a description of the way such estimates may be made see, Long-Term *Projections of National Product and Projections and Productivity Concepts*, by W. Beckerman in *Planning Education for Economic and Social Development* (OECD, 1963). See also *Projections of Output and Employment*, by J. Tinbergen in *Lectures and Methodological Essays on Educational Planning* (OECD, Directorate for Scientific Affairs, 1966).

[2] A discussion of methods of *Projecting Manpower Requirements by Occupation* is contained in the article by L. Emmerij and H. Thias in *Lectures and Methodological Essays* (op. cit.).

and social structures. Alternatively, more sophisticated comparisons relating for example sectoral productivity to occupational structure in each country may be made[1]. Use of international comparisons in this way means making some rather restrictive assumptions about technological progress. It also requires good international data which hardly exist at the present time and it is necessary to adopt a moderately cautious attitude to existing data. However, since there are now several dozen countries with information on their occupational structures[2] it is possible to undertake regression analyses of occupational structures with labour productivity, etc. with some degree of statistical confidence, provided all the usual reservations are made about classification problems and the difficulties of interpreting the results of international comparisons.

106. A further way to estimate the future occupation composition of employment is to examine current differences in manpower structures among firms in the industry. A comparison of advanced high labour productivity firms with average productivity firms can indicate the likely directions of change of occupational structures. A variation of this approach is to investigate the occupational structures associated with new net investment. It is also, of course, possible to base estimates on firms' own ideas of likely occupational changes[3] though it is probably better to use this as a test of the reasonableness of estimates based on other approaches rather than as a basic method of estimation.

107. For some occupations, requirements are closely related to variables other than output or productivity and can be independently estimated. The most obvious example is perhaps teachers themselves which can be related to the projected school population[4]. The requirements for doctors and various other professional groups can be similarly estimated.

b) *Educational Output Targets*

108. The calculation of educational requirements once occupational needs have been assessed can similarly be done in a variety of ways. One approach is to attempt to ascertain the « optimum level » of education for specific occupations, by analysing the functions of people in these occupations[5]. It can then be stated that all persons in these occupations will « require » the appropriate levels of education. For certain occupations this method is appropriate. Doctors and some other professional groups again come to mind.

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[1] For a discussion of the use of international comparisons as a basis for forecasting qualified manpower needs see *Educational and Occupational Characteristics of Manpower; and International Comparisons*, by R. Layard, J. Saigal and A. Ziderman. *British Journal of Industrial Relations*. July 1966.

[2] See « *Statistics on Occupation and Education from 48 Countries* » (OECD, Directorate for Scientific Affairs, 1967).

[3] In certain centrally planned economies there is a manpower planning unit in each enterprise which makes detailed forecasts of the firm's manpower needs in the same way that investment plans are made. These are integrated into a coherent educational plan by the central planning authority. See *Manpower Approach to Educational Planning : Methods Used in the Centrally Planned Economies*, by George Skorov in *Economic and Social Aspects of Educational Planning* (UNESCO, 1964).

[4] Though it may be useful to check projected pupil/teacher ratios against the ratios in other countries at similar levels of National Product per capita.

[5] See, for example, *Education and Economic Growth*, by R.S. Eckhaus in *Economics of Higher Education*, Ed. Selma Mushkin (U.S. Department HEW 1962).

109. Other occupations cannot be equated with specific educational needs either because the occupation is not sufficiently precisely defined or because a wide range of educational preparation is appropriate for satisfactory performance of the tasks involved. For this reason it makes very little sense to attempt to group occupations according to the estimated educational needs. The appropriate method of analysis is to have data on the complete education/occupation matrix, showing not only the average but also the distribution of educational backgrounds of people in each occupation. The projection of this matrix can be done in a wide variety of ways, but in general some attempt should be made to ascertain whether the people at the lower end of the educational scale in each occupation are performing their tasks adequately, and whether they are old people who will, when they retire, be replaced by younger people with a qualification structure corresponding more to that of the younger age groups.

110. A further problem under this heading concerns the extent of the educational information required. In general, to be able to base educational plans on manpower forecasts it is necessary to have information on the *amount* of education required (measured probably in years of study) and *type* of education (shown probably as subject of specialisation) at least of the higher levels. This is considered in detail in chapter VII.

A Conceptual Framework for Quantitative Analysis of Manpower Structures

111. An essential starting point for any attempt at setting educational output targets is an accurate statistical picture of the distribution of the existing stock of qualified manpower by employment status, by occupation and by branch of economic activity. This statistical picture should be reproduced for one or a number of target years. The change over the planning period in the vectors describing the distribution of each type of qualified manpower can then be used as a basis for estimating what should be the output of the educational system during the period. Essentially the desired output of people with any particular qualification is given by the difference between the number with that qualification in the base year and the numbers who are assumed to need it in the target year, plus the number who will retire or die during the planning period. Statistically therefore the main problems are :

- *a*) to decide on a useful classification scheme for describing the distribution of each type of qualified manpower ;
- *b*) to obtain the data to complete the tabulation in the base year ;
- *c*) to find a means to draw up a corresponding tabulation in the target year or years ;
- *d*) to estimate withdrawals from the labour force.

112. A useful conceptual framework for analysing qualified manpower structures in an integrated dynamic manner is a demographic flow matrix similar to that developed for the educational system in chapter II[1]. The

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[1] This proposal is based on a suggestion by Kjell Eide in a note to the OECD Advisory Group on Educational Planning Statistics in April, 1964. A similar scheme is outlined in *Input/Output and Demographic Accounting*, by Richard Stone (Minerva, 1966).

matrix should be constructed in such a way that it can be linked with the educational flow matrix on the one side, and with the input/output matrices of the economic planner on the other. It would show what happened to students leaving the educational system when they entered the labour force or the economically inactive population and would subsequently plot their economically significant movements until they retired or died.

113. A fundamental problem in constructing the matrix is to decide which of the movements of qualified manpower are economically significant from the point of view of educational planning. The discussion of the previous paragraphs indicates that from the point of view of manpower forecasting techniques currently in use, the most important features are the following:

1. Changes in branch of economic activity.
2. Changes in occupation or function (including movements from outside the labour force into the labour force and vice versa).
3. Changes in educational qualification.

It is necessary, therefore, to construct a set of flow tabulations that would permit the identification and analysis of movements of manpower from one economic occupational and qualification category to another, to be identified and analysed. An outline tabulation is shown in table 1. To permit such a table to be constructed, it would be necessary to record any change during the course of the period covered by the table in an individual's occupation, branch of activity or educational qualification. In addition to the characteristics mentioned above, others which might usefully be taken into account include place of residence, place of work, income, employment status, age and sex.

114. Transition proportions could be calculated in a way similar to that suggested for pupils, and likely and desired developments in these transition proportions could provide a basis for forecasting or planning manpower structures in any future time period. This tabulation can, in fact, be considered as an extension into other occupational fields of that suggested for teachers in chapter II. The arithmetical methods of making projections would be almost identical with those used in making projections of likely student numbers and, as in the case of students, the difficult part of the exercise is the calculation of the relevant transition coefficient — in this case the proportion of school and university leavers of various types who enter different occupations each year, the proportion with each qualification who change their occupation, and/or branch of activity, or who acquire another qualification.

115. To an even greater extent than in the case of students, the forces acting on the various transition proportions are extremely complex. In this case, salary and wage differentials, job opportunities, promotion prospects, social status of different occupations all play their part. In order to be able to use the model effectively, it would be necessary to have information on the extent of the influence of, and likely development in all these factors.

116. Before such a comprehensive demographic accounting model can be developed, many conceptual and practical problems must be overcome. The practical problems are concerned mainly with data needs. The first is the establishment of a classification and tabulation scheme which will

OCCUPATIONAL GROUP	AGRICULTURE				
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
GAINFULLY EMPLOYED :					
Agriculture :					
Group 0. Professional, Technical Workers					
Groups 1, 2, 3. Administrative, Clerical, Sales Workers					
Group 4. Farmers, Fishermen etc.					
Groups 5, 6, 7, 8, 9, X. Other Workers					
Industry :					
Group 0. Professional, Technical Workers					
Group 1. Administrative, Executive Workers					
Group 2. Clerical Workers					
Group 3. Sales Workers					
Group 5. Miners, quarrymen					
Group 6. Workers in Transport and Communication					
Group 7/8. Craftsmen, Production-Process Workers, etc.					
Group 9. Service, Sport, Recreation Workers					
Groups 4, X. Farmers and Other Workers not classifiable by Occupation					
Service :					
Group 0. Professional, Technical Workers					
Group 1. Administrative, Executive Workers					
Group 2. Clerical Workers					
Group 3. Sales Workers					
Group 6. Workers in Transport and Communications					
Group 9. Service, Sport, Recreation Workers					
Groups 4, 5, 7, 8, X. Farmers and Workers not classifiable by Occupation					
NOT GAINFULLY EMPLOYED :					
Pre-school age					
Formal Education					
Re-Training					
Temporarily out of Labour Force					
Not employed, not seeking employment					
Unemployed, seeking employment					
Retired					
Total					

NOTE. The occupational groups outlined above are based on the International Standard Classification of Occupations.

enable the economically significant movements of manpower to be traced. An outline of such a scheme is given in table 1. The second problem is to decide on the length of the accounting period. If the accounting period is too long (between two decennial population censuses, for example), very many significant movements of qualified manpower are likely to take place which will not be recorded. The best way of obtaining the data to construct such a manpower flow matrix would be to extend the individualised data system suggested for the educational population to include the whole population. If each member of the population were given an identification code at one census, and if each time he changed his occupation, or obtained a new qualification, or retired from the labour force, this fact were recorded, it would be possible to construct a manpower flow matrix for any length of accounting period that was considered necessary.

117. The conceptual problems spring largely from the fact that very little is known about the dynamic structure of the labour force and so it is difficult to prepare a schematic framework which takes into account all the relevant flows. In the case of the educational system, as has been suggested, pupils normally proceed from one grade or one year of study to the next in accordance with the formal structure of the educational system. It is the absence of such a formal structure that makes it so relatively difficult to deal with many branches of vocational education and sometimes higher education within such a framework.

118. At the present time, what can be validly claimed for a manpower flow matrix of the type described in this section is that it appears to be a useful way of analysing the dynamic structure of the labour force and is a promising link between economic and educational planning. As in the case of the educational flow tabulation, it directs the attention of the planner towards the vitally important transition coefficients and the factors influencing them. It can also be used as a basis for various types of simulation models in order to test the outcome of different assumptions about educational and manpower policy.

119. It may be suggested, therefore, that research be undertaken to develop manpower accounting matrices of the type suggested and that future censuses should give attention to the possibility of retrospective questioning about qualifications, occupation[1], etc., as well as collecting data on the current situation. Consideration should be given to the possibilities of establishing individualised data systems for the whole or a sample of the adult population.

Conclusions

120. With such a wide variety of methods and with little consensus about their use and with very few comprehensive manpower/educational plans sufficiently mature to provide a basis for evaluation, it is difficult to suggest precise data needs for the calculation of likely developments in the relevant coefficients. What is useful, however, is to set up the problem as

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[1] One such study has recently been undertaken by the French Institut National des Statistiques et des Études économiques. The principal results are published in *Études et Conjoncture*. Revue mensuelle de l'INSEE, No. 10, October 1966. *La Mobilité professionnelle en France.*

that those parts of the exercise which are purely arithmetical or algebraic can be clearly distinguished from those where the uncertainties of forecasting are involved. Within such a framework it is possible to undertake sensitivity analysis[1] or even to construct elaborate simulation models to test the implications of various assumptions about the rate and pattern of economic growth and the manpower developments associated with it.

121. It is clear that the formulation suggested in table I and the analysis associated with it, is unlikely to be within the capacity of any country at present, even to the extent of completing the table for two censuses five years apart (which would be about the maximum that could be tolerated for such a detailed flow structure to be meaningful). What it does show however, is the kind of analysis that is implicit in the less sophisticated exercises suggested in the preceding paragraphs. It also suggests the kind of refined analysis that might become feasible if a system of individualised data were established for the whole population.

122. A question that needs to be asked is how much of the educational system might be influenced by manpower forecasts. In most OECD countries manpower forecasts are unlikely to give much guidance for the development of primary and lower secondary education. One view is that manpower forecasts that are of most help in indicating the necessary orientation of the system between different types of education in the secondary and higher levels. In this case, of course, the information on type of qualification would be more important than that on amount of education.

123. A final point that should be made about estimating educational needs on the basis of manpower forecasts is that nothing has been said in this summary about estimating the extent to which courses leading to different educational qualifications actually do qualify people to perform the functions that they purport to. Is a man with a university degree in civil engineering actually competent to build bridges? Could his training be improved in such a way as to make him a better civil engineer or a better citizen? This is a vitally important area that has been inadequately taken into account by quantitative educational planning. Ultimately, it is to be hoped that plans for curricula and school and university organisation will be closely linked to plans concerning the number of pupils who should be pushed through the system and there are many indications that current thinking on the subject of manpower aspects of educational planning is moving in this direction.

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[1] I.e. to test the sensitivity of the model to changes in the values of the coefficients : cf. Hollister, op. cit.

Chapter V

AN INTEGRATED CONCEPTUAL FRAMEWORK FOR EDUCATIONAL PLANNING

LINKS WITH PREVIOUS CHAPTERS

126. For purposes of description the manpower requirements approach to education planning and the approach known as « demand for places » or social demand have been presented as if they were mutually exclusive. Indeed much of the controversy of recent years has implied that the educational planner has to make an initial decision as soon as he starts that he will adopt one or the other. It may be shown, however, that conceptually one approach does not preclude the other. In fact any realistic educational planner uses both. This section seeks to present a framework within which they can be brought together.

127. The most important anomaly of using the manpower approach in isolation is that unless account is taken of the available inflows into the educational system it is very easy for the « required outputs » to imply inflows that are not available, either because there are not sufficient children of schoolable age[1], or because they do not want to enter the branches of education that « manpower requirements » say they should[2]. Similar anomalies occur if plans for educational development are based on « demand for places » alone. The most important is that very many young people do regard their education as an investment in themselves that will increase their earning capacity during their adult lives. Each individual, therefore, certainly makes at least implicit manpower forecasts, and the important problem is how to make his estimates as informed as possible. There is also the broader socio-economic issue that many kinds of education, particularly at the higher levels, are extremely expensive, and unless society is likely to be rewarded for this expenditure by the increased productivity[3] of

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[1] See, for example, some of the results of the country studies in *Econometric Models of Education* (OECD 1965).

[2] For example, many educational plans based on manpower needs suggest a very rapid expansion of « second level » manpower and a less rapid expansion of « third level » manpower. To attempt to base educational policy on this finding without radically altering the structure of the educational system (after analysing social demand patterns) merely leads to social frustration, since the present structure of secondary education in most countries is such that students who successfully complete secondary education expect to have the opportunity to enter higher education.

[3] It is, of course, possible to adopt an extremely broad concept of productivity in this context, to take account of those professions whose incomes are low in relation to the benefits society derives from their services.

the beneficiary this represents a misallocation of resources. Although manpower requirements alone are an inadequate basis for planning the future structure of the educational system, the absence of estimates of manpower needs makes it extremely difficult to plan the structure of the system, particularly as regards the balance between specialised faculties in higher education[1] and technical and vocational education.

126. At the technical level the interdependence of the two approaches is clear. It is possible to think of a three-sector scheme consisting of the overall demographic and social situation, the educational system and the economy. In a highly simplified case it may be assumed that the demographic situation determines what education people will be seeking, that the economic situation determines the need for educational outputs of different types and that the two are linked by the educational system. Looked at in this way, the model described in chapter II becomes not merely a device for projecting educational outputs given certain inputs, but a valuable planning tool providing an analytical basis for harmonising economic needs for qualified manpower of different types and individuals' desires for the type of education that best suits them. One of the most important jobs of the educational policy maker is to influence social demand so as to ensure a harmony between the outputs demanded by manpower considerations and the outputs which arise from the individual's demand for education. The job of the educational planner is to provide him with the appropriate information to bring about this harmony.

A Schematic View

127. A way of viewing the educational system and its relationship to other features of society is shown schematically in diagram 1. This diagram should be interpreted as follows. The three main factors involved in educational planning are demography (shown here as births), the educational system, and the economy and society at large. These are linked by flows of new entrants, pupils and graduates (shown here as unbroken arrows, the most likely direction of flow being indicated by the arrow) and flows of ideas, decisions and influences (shown by the broken arrows, the arrows pointing to the dependent variable). The interpretation of the diagram and areas in which statistical data are required are discussed in more detail in the following paragraphs. A useful way of looking at the data gathering problem is to consider the exercise in three parts[2]:

i) Data on the pupils within the educational system;
ii) Data on other educational inputs: teachers, capital equipment, etc.;
iii) Supplementary demographic, economic, sociological and political information and also whatever assumptions are made about qualified manpower needs.

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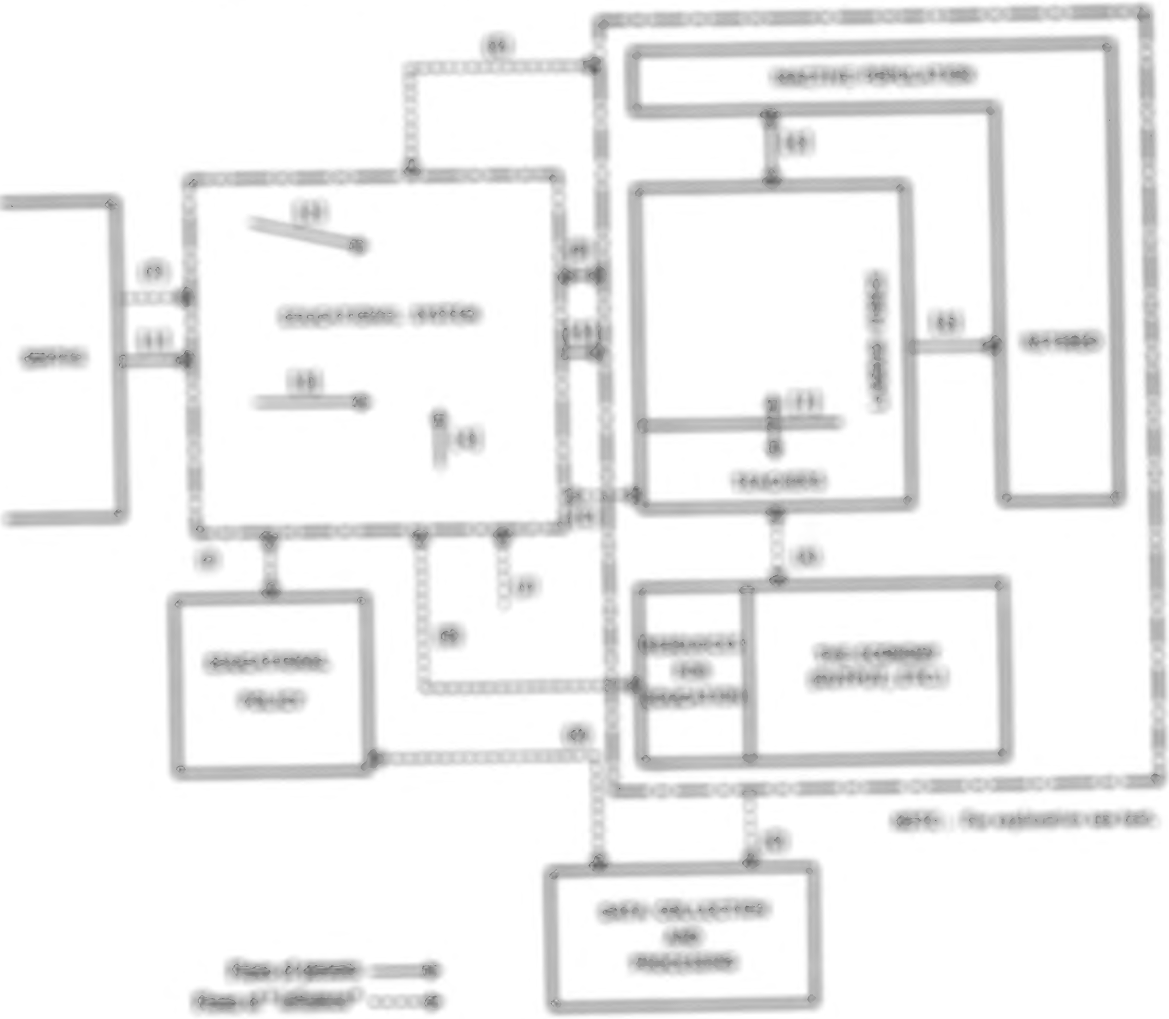
1. The Robbins Report (*op. cit.*) on higher education in the United Kingdom, one of the most complete investigations of a country's higher education system ever produced, could say virtually nothing about the balance of faculties in higher education because it made no investigations of requirements of highly qualified manpower, apart from teachers.

2. Cf. *Statistics Needed for Educational Planning*, by K.G. Brolin (mimeographed). Paper presented to Conference of European Statisticians, Working Group on Educational Statisticians, October, 1965.

Diagram 1. SCHEMATIC REPRESENTATION OF EDUCATIONAL SYSTEM AND ITS RELATIONSHIP WITH THE ECONOMY



FLOWS WITHIN THE EDUCATIONAL SYSTEM

120. The most important of the flows of pupils, students and graduates are numbered 1-9 in diagram 1. Flows numbered 2, 3 and 4 symbolize the various flows within the educational system which have been considered in chapter II. There are, of course, an extremely large number of possible flows which could be identified. It could be maintained that every time a decision or an action is taken by the pupil himself or by others, which affects probabilities about the future course of action of a pupil, this decision should be quantified and recorded[1]. Such a model is too complex to be recommended for general usage at present. There are, however, a number of points in the system where it is usual for decisions to be made which have a major effect on the child's future career. For prediction and decision making purposes it is important as a minimum to be able to put

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[1] A forecasting technique based on this approach is developed in *Micro-analytic Models of Social Systems : A New Approach to Forecasting*, by Guy Orcutt.

quantitative values to the coefficients which show the directions and magnitude of the flows of pupils at these critical points. These critical points may be thought of as junctions of a railway system in which an apparently insignificant change in the position of the track at a particular point can have a considerable effect on the ultimate destination of the train. The junctions are the decision making points of the educational system. The analogy with the railway system can be extended in that, by suitable manipulation of the points, the policy makers can decide how many trains to send in each direction. Also if no route is provided from A to B when the best available information shows that there ought to be one, a new track can be laid. This would correspond to a major reform of the educational system. The main decision making points in the educational systems of many OECD countries are enumerated below[5].

a) The decision whether to attend a publicly or privately[6] controlled institution upon first entering education, and at subsequent stages.

b) The point in the educational career where the pupil ceases to follow courses that are common to all and enters one of a number of different institutions or streams in which pupils have different expectations of subsequent educational experience. In many educational systems this is often considered to be the point at which primary education ends and secondary education begins and occurs while full time education is still compulsory.

c) The end of full-time compulsory education, at which point the pupil must for the first time make a decision about whether to stay in the full-time educational system, to leave it completely, or to undertake part-time education. This decision must be frequently retaken until the pupil finally does leave the educational system. The choice here is often very strongly influenced by the previous decisions made under b).

d) The decision at the end of secondary education whether to enter a university or equivalent institution full time, to enter another type of full-time institution of higher education, to enter one of these types of institution part time, or to leave the educational system altogether.

e) The decision upon leaving full-time education from whatever level at whatever stage whether to enter the active labour force and if so into what branch of economic activity and what occupation.

Flows into and out of the Educational System and the Labour Force

159. Other movements of people which are directly relevant for educational planning are shown as (1), (5), (6), (7), (8) in the diagram. Flow number 1) represents the initial inflow of young people into the educational system. Flow number (5) represents school and university leavers of all

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[5] It should be mentioned that though for the sake of exposition the decisions are described as if they are made by the pupils themselves, it is clear that many of the decisions are in fact made by other people — families or various public and private bodies — and that all decisions are heavily influenced by a number of factors (often measurable) other than the uninformed desires of the individual student. It should be clear from chapter II that much of the art of educational planning consists in identifying these influences and measuring their effects.

[6] « Public » and « Private » in this context are taken to summarise a number of possible administrative arrangements.

types. It includes successful completers and dropouts from all branches of education, all of whom should be distinguished in any statistical tabulation scheme. It includes also persons who become teachers, persons who enter other parts of the labour force, and persons who do not enter gainful employment upon leaving the educational system. These also should all be distinguished. Flows numbered (6) and (8) represent movements between the active and inactive population. Number (6), which corresponds to population of working age, shows movements of people (especially women) between labour force and inactive population. This is a two-way flow whose direction and magnitude depend on a variety of economic and social conditions. Flow number (8) shows retirements. In general this is a simple one-way flow whose magnitude can be determined with some degree of accuracy from population forecasts by age. These data are clearly important for the calculation of replacement needs of various types of qualified manpower.

130. Flow number (1) presents little difficulty. As far as educational planning is concerned it can be treated as an exogenous variable and the number of children to enter compulsory education will correspond closely with the number of births the appropriate number of years previously. It is also of course necessary to have data on migration, which is particularly important for regional planning. The educational planner should reasonably expect to have continually up-dated population forecasts at no more than five year intervals for at least 25 years ahead. These should include forecasts by individual ages for the population aged 0 - 30.

131. Data on the labour force and the inactive population help to provide the information on outputs corresponding to the input data provided by demographic statistics. In an ideal planning framework the educational planner would be able to expect from the manpower planners reliable estimates of the required output of each type of educational qualification for a sufficient number of years into the future. He would also have information about whether the content of the educational qualifications is adequate from the point of view of manpower needs. Unfortunately, such a state of affairs does not now exist and is unlikely to exist in the near future although manpower forecasting is becoming a specialised activity complementary to educational planning. One reason why the educational planner must sometimes himself make the manpower projections he needs is that a very important part of educational planning is, and must be a very long-term process. Such long-term peering into the future is not so vitally important to many other types of economic planning. The educational planner should, however, make use of already worked out manpower implications of existing economic plans. Such plans are now far more often established in the context of ten to fifteen year perspectives which are necessary for some types of infrastructure investment. This begins to approach the needs of the educational planner.

TEACHER FLOWS

132. Flow number (7) shows movements between one particular occupation — teachers — and the rest of the labour force. It is a two-way flow whose direction and magnitude clearly depend on changes in the relative

attractiveness of teaching and other professions. Knowledge about the direction and magnitude of this flow, and on the factors influencing it is among the most important information needed by educational planners.

133. The educational planner is interested in data on the stock, supply and wastage of teachers for two rather separate reasons. In the first place in can be considered that for teaching as for other profession, the educational system should ensure that roughly the right amount of people are forthcoming to meet requirements. Secondly, since teachers are one of the important inputs into the educational system, the system itself establishes the requirements. If there are not enough teachers with any particular qualifications the system cannot operate efficiently. If a teacher, or a person who is qualified to teach, enters another profession or the inactive labour force, this, *from the viewpoint of the educational system*, is a loss, even if the missing teachers take up other socially useful occupations like social work or bringing up a family. It is also the case that teacher supply is an area where the educational policy maker can probably exercise more influence on the orientation of the educational system than in most others.

134. The educational planner thus has a general and a specific interest in the utilisation of teacher qualifications. The specific interest is clearly very important and for this reason alone detailed information on the factors affecting the inflow and outflow of teachers is required. As far as the more general interest is concerned, teaching is no different from any other profession, and the question arises whether all the interoccupational and inter-industry flows of people with all types of educational qualification should be recorded. In chapter IV, which concentrated on the manpower methodology, it was decided that ideally the educational planner would have at his disposal details of all inter-occupation and inter-industry movements of people with each educational qualification but that in practice this must be a long-term aim.

PART-TIME EDUCATION

135. One series of flows has not been included in diagram 1, so as to avoid making it too confusing. These are the flows concerned with part-time education, with the various kinds of on-the-job training and with retraining. A possible treatment of them, within the framework of diagram 1 is shown in diagram 2. Part-time education can start only after the end of compulsory full-time education, and can (and usually does) co-exist for individuals with labour force participation. Normally the flow is from full-time education into part-time education ; the reverse flow which is not impossible is not shown in the diagram. There is, particularly in the early years of labour force participation, a substantial movement both ways between various kinds of training schemes and full labour force participation. The main problem from a statistical point of view is how much of part-time education and training to try to include. It ranges from formally organised courses in educational establishments with regular attendance for a fixed number of hours per week, to very casual instruction at the workbench. At any particular time and for any particular purpose, a limit must be drawn somewhere.

136. Another type of training shown in diagram 2 is retraining which may occur when adult members of the labour force wish to acquire new

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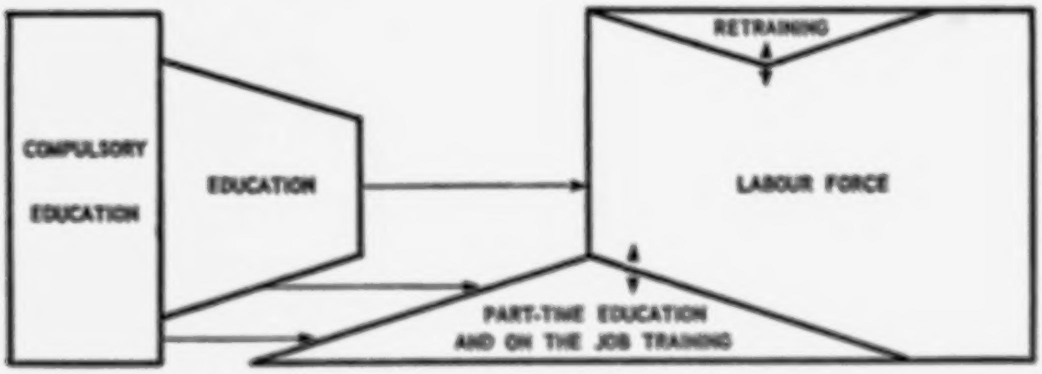
or supplementary skills. It usually concerns people who have been in the labour force for some years but are not near the end of their working life. In the earlier years people are likely to be trying to apply whatever they learned in youth. Later on it may not be worth white acquiring new skills for only a few years' work[1]. The main statistical problem at present is to decide what information is needed. Apart from registering its growing importance this subject is not treated in the present handbook in great detail.

Diagram 2. INTEGRATION OF PART-TIME EDUCATION AND ON-THE-JOB TRAINING INTO THE SCHEME OF DIAGRAM 1



THE FACTORS INFLUENCING FLOWS OF STUDENTS, TEACHERS AND OTHER QUALIFIED MANPOWER

137. In addition to the flows of people in diagram 1, there are a considerable number of what might be called flows of « influence. » These are the factors which influence the values of the various coefficients describing the flows of people. They are shown in the diagram by the letters [A] to [J]. There are undoubtedly a large number of such influences on the size and orientation of the educational system. Those shown here have been selected as being considered the most important in the present stage of thinking about educational planning. They are considered briefly in the following paragraphs.

138. Flow [A] links the labour force with the rather abstract concept, economic activity, which can be thought of as the magnitude and structure of the national product at any period in time. It is a reciprocal relationship; the size and structure of GNP affects the requirements of different types of labour, and the availability, distribution and utilisation of different types of labour affects the size and structure of the GNP. In terms of statistical needs it means that the educational planner, if he is to consider manpower requirements, needs forecasts of national product by industry of origin for the last year of his planning period and preferably for some of the intervening years. They should be accompanied by labour producti-

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[1] For a rigorous theoretical treatment of this topic see, *Training Policies under Conditions of Technical Progress: A Theoretical Treatment*, by C.C. von Weizsäcker published in *Mathematical Models for Educational Planning* (OECD 1966).

vity estimates by branch of economic activity. Ideally he should use the detailed inter-industry input-output matrices of the economic planner[1].

139. At the same time as much information as possible should be gleaned to show how the level and structure of economic activity is related to educational inputs. In the present state of our knowledge on this subject it means as much information as possible from time-series, from international comparisons and from inter-firm comparisons of how productivity changes, technology changes, new investment, etc. affect or are affected by the utilisation of people with different types of educational qualifications. This is the information that is vital for constructing an occupation by education by branch of activity matrix, or set of alternative matrices for any future year.

140. The flow that is labelled [B] links the economic activity box to the education box. It shows the forces which determine how much of its real resources an economy chooses to devote to education at any particular point in time. It is a two-way flow : the desired size and quality of the educational system indicates needs and the state of the economy determines how many resources society can afford to devote to education. There are thus, in fact, a number of different forces pulling against each other and the resultant is the actual resources devoted to education in any particular period. To the extent that these resources and the factors influencing their allocation can be considered as being represented by financial and monetary flows they are treated in greater detail in chapter VI and in annex V.

141. The flow marked [C] between teachers and the educational system has as least two different meanings corresponding to at least one influence in each direction. Of these the more straightforward is that which makes teachers the dependent variable. In this case it shows that the size and structure of the educational system determines the numbers and the type of teachers that are required. Various types of statistical information are necessary to make this calculation ; as a minimum the numbers of pupils in each branch of education must be estimated and targets set for pupil/teacher ratios. More sophisticated data are required to estimate teacher needs in particular disciplines, to take account of the use of part-time teachers and so on.

142. The reverse flow, which makes the educational system the dependent variable is a rather more subtle concept. It arises from the key strategic position in the educational system that is occupied by teachers. Education is for the most part what teachers teach pupils[2]. The attitudes,

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[1] It is important to distinguish between : national product by industry of origin and the pattern of final demand. GNP projections are usually demand projections and when disaggregated by means of income elasticity estimates the pattern of final demand by branch of activity can be determined. The manpower planner, however, needs estimates of net output by industry of origin. These can be obtained from the final demand estimated by means of input-output matrices. For a full discussion of this point, see the article by W. Beckerman in *Planning Education for Economic and Social Development* (OECD, *op. cit.*).

[2] This statement is not intended to provoke any profound discussion of educational or learning theory. It merely states that the point at which « education » takes place is usually when « teachers » come into direct or indirect contact with « pupils ».

aptitudes and skills acquired by pupils in the educational system are for the most part acquired with the help of teachers. If there are insufficient teachers to teach a particular subject, either some pupils will not be able to learn that subject, or those that do learn it will learn it less well than they otherwise would. Similarly, if teachers are heavily biased in favour of particular types of education, this bias is likely to influence pupils when they make their critical educational decisions. This influence has often led to an excessive emphasis on « academic » branches of education. These two factors can mean also that a shortage of specialised teachers can set up a tendency to reinforce itself. A shortage of mathematics teachers discourages pupils from studying mathematics. This lowers the supply of people qualified in mathematics, raises the employment opportunities outside teaching of those that are so qualified, and thus diminishes the future supply. Many aspects of this factor, particularly those involving attitudes, are not susceptible to general statistical reporting. They should, however, be the subject of intensive research by psychologists, sociologists and educationalists. At a more general statistical level, however, teacher shortages by specialisation should be defined and measured at regular intervals.

143. The flow marked [D] shows the effect of the labour market situation on the educational system and vice-versa. It indicates the extent to which the labour market situation affects the choice made by pupils within the educational system. This may make itself felt either simply through employment opportunities available or through movements in relative wages and salaries. If, for example engineers' salaries are rising relatively to those of other professions, other things being equal, this is likely to encourage young people to study engineering in the schools and universities. Conceptually it is possible to consider this problem in terms of elasticities — an X per cent rise in the salary of profession A relative to salaries in other professions is likely, other things being equal, to increase the number of pupils who study subject Q by Y per cent over the following S years. In practice such an analysis would be extremely difficult to conduct statistically since the « other things » would very rarely stay equal for long enough to test the hypothesis. It does, however, give an additional reason, beside manpower forecasting for collecting detailed data on the deployment and utilisation of educational qualifications. Even if it cannot be shown that the economy requires specific numbers of people with various types of qualification it should at least be possible to ensure that the talents and qualifications that young people acquire in schools and universities are not going to be completely useless in their adult life. It will be recalled that the direct manpower supply influence has been treated under the heading of flows of people.

144. The flow that is marked [E] groups together all of what can be called the socio-economic influences that affect pupils' educational careers. There are a very large number of such influences of which those which research has shown to be the most important are listed below[1] :

i) the occupation of the child's father ;
ii) the education acquired by the child's parents ;

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[1] See : inter alia, *Ability and Educational Opportunity*, ed. Halsey, OECD 1961. *Micro-Analysis of Economic Systems, A Simulation Study*, by Orcutt, Greenberger, Korber and Rivlin — Harper and Row. New York 1961.

iii) the income of the child's family;
iv) the distance of the family residence away from educational institutions at the various levels;
v) race and religion.

It is not unreasonable to expect ultimately to obtain statistical information on all these factors at least on an irregular sample basis. It might be desirable to start by obtaining data on the socio-economic background of children as they crossed each of the important thresholds outlined earlier.

145. The flow marked [F] indicates the inherent individual characteristics acquired by the child at birth and in the very early years of his childhood, with which he enters the educational system for the first time. It would include characteristics such as intelligence, health creativity, dexterity, etc. all of which exercise an influence on a child's educational experience under any educational system. It is, however, extremely difficult, if not impossible, to integrate these factors into a formal statistical framework. In the first place many of them cannot be measured. Secondly, even those that might be measurable cannot be reliably measured at very early ages. Thirdly, one of the functions of education is to develop the inherent capabilities of children, at least those that are considered to be socially desirable. The inherent characteristics of children are modified by their educational experience. Many educational systems by concentrating on the abilities that children already have widen the dispersion of ability — others try to close the gap by devoting special attention to children who are less able in particular fields. It is clearly impossible to collect regular statistical information of this nature on children entering school. Nevertheless the importance of this factor should not be forgotten, and it may be desirable, particularly for short-term forecasting, to use some measure of current or past performance as an indicator of future performance.

146. The flows marked [G], [H], [I] and [J] van be considered together as those which represent the planning and policy making complex of the educational system. Flow [G] is fairly straightforward. It simply shows that somewhere in the educational policy making machinery a mechanism should exist for collecting and processing all types of data, that are relevant for the formulation of educational policy. Many of the statistical data that should be collected are considered in the present handbook. The flow marked [H] indicates that once the data have been collected and processed the results should be fed into the policy making machinery as a basis for decision making and also that the needs of policy makers and administrators should to some extent determine what data are collected and processed. The collection of information on educational research itself must be a part of any statistical programme for educational planning purposes.

147. Flows marked [I] and [J] are rather more difficult to interpret. The flow marked [I] leaving the educational policy box shows that nearly all aspects of the educational system are subject to some measure of control or influence by the educational policy makers. Clearly, the extent and methods of this control or influence depend upon the administrative structure of the national educational system or systems. It will range from limited intervention to ensure certain minimum standards in educational institutions, through partial or full financial control, to full central control of curricula, etc. It may or may not encompass control of teacher recruit-

ment, regulations of school construction, the prescribing of certain textbooks and so on. One task that needs to be undertaken by any planning authority that wishes to be really effective[1] is a thorough analysis of the decision-making mechanisms and the forms of control available to the central policy making authorities. Of the flows into the educational policy box, that from the data processing mechanism marked [H] has been considered above. Finally, the flow marked [J] is open-ended indicating that, even if all the other factors influencing the system are enumerated, analysed, assigned numerical values and evaluated, the system is still open and subject to very many influences which cannot be neatly integrated into any formal analytical framework. For example, not only educational policy itself may affect the educational system, but also economic, military or foreign policy decisions. For example, a decision to institute or to end conscription of young men for military service will have substantial effects on the educational system, at least in the short period. This open-ended flow is also a reminder that the educational planner and policy maker must take into account such unquantifiable but important factors as public opinion, ideological prejudices and changes in educational theory.

148. A useful way of looking at the educational planning problem is to consider the educational planner as testing the effects on the system of various « imputs » of « policy. » He continues to do this until he achieves the « best » result, taking into account the values of society as expressed through its policy makers. This « best » result is extremely difficult to define but can probably be thought of as the result of applying some social cost/benefit calculus[2]. In principle, the planner may in this way test policies concerning the whole educational system or such specific issues as whether a particular school should recruit an additional mathematics teacher[3]. He will not, however, be able to make the tests effectively until he has quantitative data to complete an analytical framework similar to that outlined in this chapter. While it may be wrong to think of educational planning as a mechanical statistical exercise, it is impossible to rationalise many aspects of educational decision making without assigning, at least implicitly, quantitative values to most of the magnitudes that have been discussed.

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[1] And which has been undertaken by very few educational planning authorities at the present time.

[2] A preliminary mathematical treatment of this type is contained in *An Optimization Model for Education and the Economy*, by J. Benard in *Mathematical Models for Educational Planning* (OECD, Paris 1966).

[3] This begins to become an operational research approach to educational planning. Cf. *An Operational Research Project for Technical Education*, by Stafford Beer, Operational Research Quarterly June 1962.

The next methodological developments in educational planning will probably move in this direction.

Chapter VI

THE COSTS OF EDUCATION — METHODS OF ANALYSIS AND PROJECTION[1]

149. Previous chapters have considered methods for forecasting and planning the educational system in real terms, pupil and student numbers, qualified manpower needs and supply, teacher needs, etc.

150. The present chapter is concerned with estimating the costs of these real resources in monetary terms. It presupposes that at least three quantitative estimates have already been made for each level and type of education :

— the present and future number of pupils or students ;
— the present and future number of teachers and professors ;
— the present and future number of schools, classrooms, universities, etc.

151. It is assumed that the projection of future costs is directed at translating these real resources into monetary terms. From this point of view the preparation of an educational plan may be viewed as a three-stage exercise :

a) estimates of the numbers of pupils or students in each branch of education (if the educational system is viewed as some kind of production process these may be considered as the basic raw material inputs);
b) estimates of the real resource inputs which are necessary in order to transform these raw materials into finished products (this includes teachers, buildings, equipment, etc.) ;
c) estimates of the monetary cost of these real resource inputs.

152. A fourth step in the educational planning process is the analysis of the availability of financial resources for these required monetary expenditures. This topic is dealt with in Annex V. The present aim is to begin to develop a methodology by which a bill for each of the main types of educational expenditures required by the plan can be drawn up. The principal interest of such an exercise is to compare the requirements of an educational plan, in total or in its details, with the resources which are likely to be available for its realisation. Subsequently a comparison of actual realised expenditure in each category with that estimated in the plan, can reveal the extent to which the plan is being implemented, and where it

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[1] This chapter makes extensive use of a paper by C.P. van Dijk entitled *Lectures and Methodological Essays on Educational Planning*, OECD. Directorate for Scientific Affairs. Paris 1966.

is falling short, so that special efforts must be made in subsequent years. If actual expenditures consistently fall short of required expenditure because of unforeseen financial constraints, perhaps because the assumed rate of economic growth was not achieved, this will indicate the necessity of revising the real resource plans. If on the other hand the expenditures keep pace with estimated needs but this does not bring forth the expected student enrolments or output of graduates, this would give grounds for re-examining the technical and behavioural coefficients used in the planning of student numbers, teacher requirements, etc.

153. Before undertaking the projection of future educational costs it is clearly desirable to make a preliminary analysis of past educational expenditures. Future expansion of the educational system is never a completely new start but always a continuation of an existing system with old (sometimes centuries old) traditions. These traditions — what a community considers as « normal » and economically and politically « feasible » — will certainly play an important role in the allocation of future educational funds. By building the financial plan on the basis of a careful analysis of expenditure in the past, these traditions will in part be taken into account.

154. Consequently this chapter will deal with two main problems:

a) the analysis of educational expenditure in the past;
b) the projection of future educational expenditure.

In addition to that given above there are clearly other more specific technical reasons for basing projections upon a careful analysis of past expenditures. Since there are various methods of projecting future costs it will be necessary to select one which is appropriate in a certain real situation. The choice of projection methods will determine the degree of refinement of the analysis of expenditure in the past and conversely the results of the past analysis will suggest which projection methods are most appropriate. Furthermore the analysis of the past situation will reveal the important inadequacies in the available statistical information. Finally, of course, the availability of data will influence the choice of projection methods.

THE ANALYSIS OF PAST EDUCATIONAL EXPENDITURES

155. The first task is to establish a suitable classification scheme which will permit the quantification of the magnitudes which are considered important for the analysis. The preparation of such a classification scheme raises even more acutely than in many other branches of educational statistics the problem of the definition of education. The problem is a twofold one: many authorities and enterprises, both public and private, whose principal activities are not educational, undertake educational expenditures of different types as a part of their normal activities, whereas on the other hand not all of the expenditure of specialised authorities, such as the Ministry of Education, can be regarded as educational. For example, many Ministries of Education have additional cultural and scientific responsibilities which, although often linked with education institutions, can be described as strictly educational only with difficulty. The definitions and systems of classification adopted must, therefore, carefully be circumscribed with specific planning needs in mind, and what is appropriate for one purpose may not be appropriate for another. For example, student aid by public authorities is certainly a part of the public authorities' educational expen-

diture. From the viewpoint of national accounting, however, such aid is merely a transfer payment to certain individuals in society, and it is only when students use the funds for the purchase of educational services that they become part of the national educational effort. For these reasons the present handbook does not attempt an abstract definition of the term education, but rather concentrates on specific financial magnitudes that are of interest to the educational planner.

156. The basic question is therefore not « What is a suitable definition of education ? » but rather « Which monetary magnitudes are of interest to the educational planner ? » In very general terms this latter question may be answered as follows :

— all expenditures incurred by or on behalf of public and private educational institutions for the purchase of real goods and services necessary to provide the pupils or students with instruction ;

— direct aid expenditures on behalf of pupils and students by public authorities and private institutions (Payments by households for the maintenance of pupils and students are not treated in this handbook. This results in a certain asymmetry, since grants for student maintenance by other economic bodies are considered for some purposes. The treatment is therefore budgetary rather than economic, but this seems to correspond more closely to the realities of educational planning);

— indirect educational expenditures, which include a number of items ranging from aid to students for maintenance[1], etc. to the costs of the administration of education.

157. How much and what type of statistical information is required on each of these major topics depends, of course, on the degree of refinement of the analysis and upon what it is intended to achieve. The following list would serve the purposes of analysis at a fairly high level of refinement, but is considered to be the minimum necessary to provide a basis for realistic projections of educational costs. The information should be collected regularly, preferably annually. The question of whether a calendar year, a financial year or a school year is the more appropriate is not treated here, since in any case this is largely a pragmatic issue which will be determined by the exigencies of national conditions.

1. Total government expenditure on education.
2. Total private expenditure on education.
3. A breakdown of the total expenditure, both public and private, at least into the following main groups :
   — capital expenditure ;
   — current expenditure ;
      i) expenditure on personnel ;
      ii) other current expenditures ;
4. Current expenditure should be further broken down under the following headings :
   i) expenditures on personnel :
      — salaries and wages of teachers ;

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[1] An appendix to this chapter gives special attention to ways of treating aid to students.

    — salaries and wages of other personnel ;
    — other payments to personnel :
        a) special allowances (housing allowances, etc.);
        b) social security payments[1];

ii) other current expenditures :
    — maintenance and repair of buildings ;
    — expenditures on replaceable equipment (exercise books, etc.);
    — maintenance and replacement of furniture ;
    — electricity, water, heating, cleaning, etc. ;
    — expenditure on school administration other than personnel expenses ;
    — welfare expenditure (health, recreation, school meals, etc.);
    — other operating expenditures ;

iii) capital expenditure :
    — land ;
    — buildings ;
    — fixed equipment, furniture, etc.

iv) interest payments.

5) The level and structure of teachers' salaries, the difference in salaries between men and women, between qualified and unqualified staff, between departmental heads and other teachers, according to length of service, etc.

6) A price index for a number of the more important materials used for educational purposes : school furniture, instruments, tools and equipment, books, stationery, laboratory equipment, etc.

For many purposes it will also be necessary to have a further breakdown of the items listed under 1, 2, 3, into the following classifications :

a) public and private schools ;
b) urban and rural schools ;
c) regions of the country ;
d) size of schools ;
e) the different faculties in higher education ;
f) newly established and older schools.

After collecting and classifying the above mentioned data, it will be possible to construct analytical tables which will permit the evaluation of the data from a number of different viewpoints. The models used and the degree of refinement will depend on the data available and the particular analysis which is required.

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[1] The precise treatment of social security expenses will, of course, depend upon national conditions. Where there is a specific pension fund for teachers and other educational personnel, employers' contributions to such a fund should be included as part of educational expenditure, but in this case of course payments out of the pension fund would not be included in educational expenditure. In some cases there is no contributory pension fund for teachers, but a specific government financed pension fund for retired teachers exists. In this case payments out of this fund should be considered as a specific item in educational expenditure. Where teachers' pensions are part of a general national pension scheme it is best to ignore pensions altogether as an educational expenditure.

158. The first type of analysis which might be undertaken is the relationship between the main components of the total cost, for example between personnel and other current expenditure, or between the various components of expenditure on educational materials[1]. If the analysis shows that there is a systematic relationship between some of the cost components, this would greatly facilitate the task of making projections of educational expenditures. Instead of spending much time and effort on cumbersome calculations of relatively unimportant cost items, it will be necessary only to concentrate on one or two important cost factors and assume that the others will develop proportionately. It may, for example, well be possible, at least in the short run, to assume a systematic relationship between teachers' salaries and total current expenditures.

159. The next step of the analysis is to try to explain the determinants of cost changes over as many years as possible. As an initial working hypothesis it may be assumed that the level of educational expenditure in a year is determined by three factors :

1. quantity ;
2. price ;
3. a residual factor which may be closely related to educational quality.

160. Quantity. The most fundamental measure of the quantity of educational effort is the number of pupils or students enrolled (possibly expressed in full-time equivalents in the case of part-time students). One of the simplest ways of making rough estimates of future educational costs is to multiply the projected number of students in each branch of education by *an estimate of expenditure per student*. This method is subject to grave deficiencies which are indicated later in this chapter, but is a useful way of arriving at global figures with a minimum of statistical information[2]. Other important indicators of the quantity of education are the number of teachers and the number of school buildings, classrooms, etc[3].

161. Logically the greater part of educational expenditure is not unequivocally and directly related to the number of pupils. By far the most important element in current expenditure — expenditure on salaries — is much more closely related to the number of teachers and other school employees, and it is highly preferable to use this indicator of changes in the quantity of education when projections of educational expenditure are being

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[1] It has been suggested that such a systematic relationship might be found between the two major categories of capital and current expenditure. Empirically this is not the case, as examination of relevant time series from almost any country will show, and conceptually there is virtually no reason why it should be so, since capital expenditures are related at least in part to estimated future numbers of students, whereas operating expenditures are related to the present number of students. Furthermore, capital costs are able to fluctuate to a much greater extent than operating costs.

[2] Even here it is necessary to distinguish between current expenditure and capital expenditure. The appropriate concept for capital expenditure is the cost of building a new student place multiplied by the number of student places which must be built during the planning period. It may be noted that the number of new student places required is not the same as the increase in the number of students, since a number of places must be built to replace obsolete buildings, alleviate overcrowding, etc.

[3] The question of suitable units for measuring classroom space is considered later.

made. It may be assumed that the educational plan has already made projections of required number of teachers according to different categories. Where possible, expenditure on equipment should also be related to physical units. This, however, raises two problems, first that it then becomes necessary to project the required number of physical units of each type of equipment and secondly that it is necessary to obtain price indices for each item. Furthermore there are a very large number of different items of equipment used in the educational process. It is therefore suggested that independent projections of required expenditure be made for the major items of equipment and that expenditure on books and paper, etc. is considered to be related to the number of pupils (of course systematic changes in expenditure per pupil on these items where they can be identified from past statistics or from future intentions may be taken into account when making projections).

162. Price. Price changes affect estimates of educational expenditures through their effect on the relative levels on teachers' salaries as compared with other salaries and their effect on the price of materials purchased for the educational sector as compared with a general price index. It is usual for estimates of future expenditures to be made in terms of constant base year prices, since the attempt to project price indices for a large number of individual items is a very hazardous operation. This does, however, lead to certain inconsistencies in the case of teachers' salaries, since it is usual to project an increase in the salaries of teachers. From a national income accounting point of view the salary per teacher is the same as the price of teaching services, and therefore to project an increase in salaries amounts to a projection in the increase of the price of this service. The simplest way of dealing with this theoretical inconsistency is simply to admit it and to continue to make projections based on the expected or planned rise in teachers' salaries since, for practical purposes, it will have very little effect upon the numerical results[1].

163. Qualitative and other residual components of expenditure changes. The degree to which this factor should be investigated in the preliminary analysis depends mainly upon the extent to which large parts of the expenditure are not explained in terms of quantity and price changes. The following are some of the factors which might be investigated :

a) expenditure on personnel :
  - changes in the sex composition of the teaching staff (even where there is equal pay for male and female teachers expenditure on male teachers may be higher because of family and children's allowances, etc. Furthermore it may well be the case that promotion is more rapid for men than women) ;
  - changes in the proportions of qualified and unqualified teachers ;
  - changes in the age composition of the teaching staff and in the average length of service; a rapid expansion of education may result in a growing proportion of young and relatively low paid teachers ;

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[1] For a discussion of this topic see *Investment in Education*, Report of the survey team appointed by the Irish Minister for Education in association with the OECD, Appendix 5, Section A, paras. 13 & 14 (published by the Irish Government Stationery Office, Dublin, 1966).

- shortages of teachers of particular specialisations may result in differential salaries. Such factors should also be taken into account ;

b) other expenditures : other factors which are likely to affect the level of educational expenditure include :

- changes in the age of school buildings which will affect maintenance expenditure. This is likely to be low during the first few years of a new building's life ;
- modernisation may also alter the methods of heating, cleaning may no longer be the work of the caretaker but may be entrusted to special cleaning firms, etc. ;
- an increasing proportion of expenditure is often devoted to ancillary activities, such as facilities for sports, recreations, meals, etc. ;
- changing teaching methods are likely to affect the type and quality of books, instruments, equipment, etc. ;
- in the case of capital expenditure there may have been changes in the legal of actual classroom space per pupil. Apart from this, changes in the legal maximum or minimum size of classes may have considerable effects upon the rate of classroom utilisation and hence upon classroom costs per student.

164. Preliminary analysis along the lines indicated above will permit the calculation of a wide range of technical coefficients which may be used as a basis for calculating the cost of planned educational developments. A number of such technical coefficients are listed below.

- Estimated salary per teacher during the planning period, according to age, sex, status and specialisation, in each of the main branches of education.
- Estimated cost per unit of each of the major items of equipment required by the educational system (television and radio sets, desks and work benches, etc.).
- Estimated expenditure per pupil of other miscellaneous items of equipement. It is particularly important in the case of this item to have a breakdown by type of education, since some curricula have very much more expensive equipment needs than others.
- Estimates of the cost of providing a new student place in each of the main branches of education. (Here again there are likely to be wide differences between different specialisations.)[1]

165. So far the discussion of cost analysis has dealt only with rather aggregate national expenditure figures for each branch of education. Very often these global figures conceal considerable variation between different categories into which the educational system can be divided. There may be large differences between urban and rural schools and between various regions of the country, costs in private education may differ greatly from those in public education, large schools may have a different cost structure

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[1] Capital costs per new student place in universities in the United Kingdom in 1965 were as follows :

— Arts Faculties	£ 1500
— Pure Science	£ 3400
— Applied Science	£ 4800.

from small schools and so may newly established modern schools from older ones. In addition the costs of the different faculties of higher education undoubtedly vary widely in most countries[1].

166. Before, however, undertaking the substantial amount of work involved in collecting the statistics necessary to analyse all these differences, a number of points need to be made.

a) In many cases these apparent differences in costs will be in fact the result of different pupil/teacher and/or pupil/classroom ratios. These differences do not form an additional explanation of the development of educational expenditure because they are already included and accounted for in the total number of teachers and classrooms to which costs were related. For projection purposes it is necessary to ascertain whether or not the planned number of teachers and classrooms for the target year as given in the general

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[1] According to the van Dijk study (*op. cit.*) costs in the Netherlands were found to differ greatly in all these respects.

1. Non-personnel current expenditure of private primary schools in the Netherlands between 1954 and 1961 (on a per pupil basis) were some 25 per cent lower than for public schools. This difference was even greater for secondary grammar schools in 1950 but had completely disappeared in 1961. In the field of higher education current expenditure of private universities is also lower than that of public universities.
2. Regional differences could only be investigated for primary education; on that level costs-per-pupil in the various provinces varied considerably.
3. The importance of the differences in costs per student for the various faculties of higher education may be gauged from the following figures, which were derived from the accounts of the State Universities of Utrecht, Leiden and Groningen (long established universities with 7,800, 6,100 and 4,200 students respectively). The faculty figures are expressed in percentages of the average current costs per student of the university concerned for the year 1962.

	UTRECHT	LEIDEN	GRONINGEN	TOTAL
Average current costs per student (*in guilders*)	5414 = (100)	5824 = (100)	5426 = (100)	5553 = (100)
Theology	40	71.5	73.5	52
Law	34	32	40	34
Medicine	203	234	224	221
Dentistry	88	—	116	97
Mathematics and Natural Science	105	109	115	109
Literature and Philosophy	86	44	48	58
Veterinary Science	156	—	—	156
Geography	33	—	—	33
Ethnology	40	—	—	40
Modern Philosophy	10	—	—	10
Economics	—	—	35	35

It should be added that the high costs per student of the medical faculty is caused by the fact that the subsidies to the Academic Hospitals are included in the total current costs of the medical faculty. These subsidies amounted to no less than 36 per cent of costs in 1962.

It is evident from the above figures that differences of this magnitude cannot be neglected in a projection of future costs ; any projection based on a global, average cost figure, irrespective of the faculties involved, will be not very useful.

educational plan has already accounted for these differences (e.g. by including extra teachers for smaller rural schools, etc.). If so differences of this type are irrelevant to cost projections and may be excluded from the analysis.

b) For projection purposes it is worth analysing the detailed cost per components only where it is expected that the various sub-sectors will grow at different rates and where information is available upon the expected development of these sub-sectors in real terms. For example, where a group of university faculties (e.g. natural sciences) are expected to develop at the same rate, or where projections have been made only for the group as a whole, it does not make much sense to undertake a detailed analysis of the various sub-groups. This really amounts to saying that the analysis of educational cost should be an integral part of the total educational planning activity.

167. The relation between size of school and costs and between age of school and operating cost is likely to be particularly important. This is especially the case when the educational system is expanding, since when the number of pupils is growing there is likely to be a tendency to increase the average size of school and the proportion of new schools will be high because of the continuous addition of new school units to accommodate the growing school population. Both factors can be expected to influence the operating costs of the school. Clearly also there is likely to be a difference in capital cost per new student place according to whether the places are made available by the expansion of existing facilities or by the creation of new units[1].

168. The analysis of the difference in operating costs according to the age of schools is particularly important for purposes of projection. New schools are often equipped with modern amenities, furniture, instruments, etc. and may well be more expensive to run than older schools with much less equipment to maintain. On the other hand new schools may have more efficient heating systems and require less cleaning, etc. A priori judgements are not possible except insofar as they indicate that there are likely to be differences which should be examined. As new schools are built more and more schools obviously will have the operating cost structure of modern schools and a declining proportion that of the older schools.

THE PROJECTION OF FUTURE EDUCATIONAL EXPENDITURES

169. A number of different methods may be used for projecting future educational expenditures upon the basis of the analysis described in the previous paragraphs. Most of these have already been indicated and they are simply summarised here with a few additional comments about their use in particular circumstances. As mentioned above the choice between

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1. The report on Investment in Education in Ireland (op. cit.) shows that teaching cost per pupil in 1961/62 varied from £37 in one-teacher schools to £12 in schools with seven or more teachers. In the period 1958/62 the total capital cost per pupil place varied from £140 for one-classroom schools to £94 for schools with four to six classrooms. Schools with seven or more classrooms showed a sharp rise in capital costs to £122, which is apparently due to different architectural arrangements for the larger schools (Chapter IX, Tables 9.9 and 9.11).

methods will depend very largely upon the statistical data it is possible to collect.

THE PROJECTION OF CURRENT EXPENDITURES

170. The quickest and simplest way of projecting future current expenditure is by estimating the average expenditure per pupil for one or a number of years and multiplying this by the expected number of pupils in each year of the planning period. This method has the attraction of simplicity and it requires little time and statistical information. Its weaknesses are, however, such that it should only be used where time or the available statistics prohibit the use of more sophisticated methods. As was shown in the previous section educational expenditure is not directly related to the number of pupils but rather to the real resource inputs into education. It has been estimated that if, in 1950, this method had been used in the Netherlands to project current expenditure on secondary general and higher education in 1961, the outcome of the calculations would have been 33 1/2 per cent and 60 per cent respectively below the actual expenditure figures in 1961[1] [2].

171. Since the remuneration of personnel is usually by far the most important component of current expenditure, a projection based not on the number of pupils but on the number of teachers and the estimated increase in their remuneration is likely to provide a much better and almost equally straightforward method of approach. In its simplest application the total current expenditure in the base period is multiplied by the increase in the number of teachers and the expected rise in teachers' salaries over the planning period. This of course assumes that the share of personnel expenditure in total current expenditure remains constant over the planning period. If this projection method had been used in the Netherlands in 1950 (and if the estimate of the number of teachers and their salaries had been correct) the errors mentioned above would have been reduced to 10 per cent for secondary education and considerably less for higher education[3].

172. More sophisticated methods of projection will make full use of the analysis outlined in the preceding section. This analysis will have indicated the principal components of educational expenditure and costs in each branch of education, and the projection of future expenditure can be based on this knowledge. If, for instance, it were found that the level of personnel expenditure was determined mainly by the number of teachers, the level of salaries, the age and sex of teachers and their qualifications, a projection could be based on the planned increase in the number of teachers, the expected rise in their salaries and the change in their qualification and age structure[4].

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[1] See van Dijk (op.cit.)

[2] For purposes other than projections the cost per pupil concept can be of considerable value. It can, for instance, provide a useful starting point for the investigation of differences between the various levels of education, the various faculties of higher education, the various regions of the country, etc. It can also be used (with caution) for international comparisons. An extension of the concept to cost per graduate can provide a starting point for the analysis of the comparative « productivity » of different educational systems.

[3] See van Dijk (op.cit.)

[4] This last calculation can fairly readily be made if the age and qualifications of new teachers is known.

173. Similar independent projections may be made of a number of other important cost components such as major items of equipment, maintenance and repair of buildings, electricity consumption, etc. It may be recalled, however, that the number of individual items consumed in the educational process is rather substantial and detailed projections for each item are likely to prove rather complicated. However, the process of making projections can be very much simplified if the preliminary analysis has revealed a systematic relationship between a number of different cost items. If, for example, the price indices for various different types of equipment move roughly together with one another and if there is no reason to suppose very different rates of increase in the utilisation of the different equipment items, they can conveniently be projected as a single item, and attention can be focused on the more important cost elements in the group, with the assumption that the others will develop proportionately.

174. Another way of dealing with the items of current expenditure other than personnel remuneration is to treat these costs on a per student basis. Assumptions can be made about an increasing per student expenditure on these items to allow for the improved quality of education insofar as it is represented by more and more expensive equipment.

175. The extent to which it is necessary to make a detailed breakdown of the global projections of educational expenditures into detailed projections for

1. public and private schools;
2. urban and rural schools;
3. new and old schools;
4. large and small schools;
5. the various regions of the country, and
6. the various faculties of higher education,

will depend largely upon three considerations:

1. the purpose of the projections: it may be that for the particular purpose in mind a single set of global national projections is sufficient. For other purposes, particularly those concerned with the implementation of the educational plan it will often be necessary to have detailed projections at least for each region of the country;
2. whether the preliminary analysis has revealed that there are significant differences in costs between these various types, sizes, and locations of schools (e.g. that rural education is cheaper or more expensive than urban education);
3. whether the educational system is expected to develop more rapidly in some respects than others (e.g. that some faculties in higher education grow faster than others, etc.). If the various types of schools of the various faculties of higher education are expected to develop at more or less the same rate there is little point in making refined projections for each of these sub-groups.

Clearly the answer to many of these questions will be found in the real resource part of the educational plan, which will probably contain information about the expected development of public and private education of rural and urban schools, of the necessary additional number of new schools and the replacement of older ones, of the future size distribution of schools, of regional development and of the growth of the various faculties of higher education.

PROJECTION OF CAPITAL EXPENDITURES

176. The projections of future capital expenditures can best be made upon the estimated cost of providing a new student place. In most countries, at least insofar as public education is concerned, the amount that may be spent upon providing a new student place is prescribed within rather narrow legal limits. Whether this is the case or not a study should be made from time to time of the actual cost of providing new student places. This survey should of course use the same types of classification that have been indicated in preceding paragraphs, i.e. distinctions should be made according to branch of education, locality, size of school, faculty of higher education, etc.

177. The projection of capital costs per student place into the future will, as with all projections, be largely a matter of judgement. The factors which will influence this judgement include expected future price levels in the construction industry, changes in the legal requirements of classroom space per pupil, expected changes in the actual amount of classroom space available per pupil, anticipated changes in the amount of ancillary facilities per pupil (corridors, toilets, libraries, recreation facilities, etc.).

178. When estimates have been made of the expected future cost per student place in each branch of education and type of school these are multiplied by the required number of new student places in each type of school, to arrive at an estimate of required capital expenditure. It should be recalled that as well as the increase in student numbers the number of new places required must include an allowance for replacing obsolete buildings and very often to alleviate overcrowding. An additional factor that often needs to be taken into account in estimating the required number of new student places occurs when there is substantial internal migration. This may well result in a number of available places being unused because the school age population in some areas has declined since the time when the schools were built. Unless very detailed region-by-region statistics are available this can result in a kind of statistically invisible overcrowding in the areas which are receiving population.

179. Another method of estimating future capital expenditure requirements is based upon estimates of the cost of providing new classrooms, workshops and laboratories, libraries, etc.[1] Although this method bears a superficial resemblance to that recommended for calculating future current expenditures in that what are actually built are classrooms and not square metres per pupil it is open to a number of objections as a medium and long-term planning tool. In the first place a classroom is not a very homogeneous concept and could refer to anything from a small seminar room to a fairly large lecture hall. Secondly the cost per classroom is likely to vary considerably according to the size of the school in which the classroom is placed. Thirdly it requires projections not only of the average number of pupils per class, but of their distribution in different sized classes

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[1] See for example the Mediterranean Regional Project country report on Greece; OECD, Paris, 1965, Chapter 10.

If projections are based simply upon a constant average number of pupils per class this amounts to the same thing as projecting the number of student places. The method is, however, valuable for short-term budget making. It is, of course, virtually impossible in the case of higher education.

180. A particularly difficult problem in estimating the required capital expenditures of an educational plan is the phasing of these expenditures over the planning period. While the number of places required by a specific date to meet pupil needs can fairly readily be calculated, it is a fairly intricate operation to phase the capital expenditure programme such that available places and pupil numbers keep pace with one another throughout the planning period. This is an additional reason for the development of sophisticated planning models.

PREPARATION OF THE FINANCIAL PLAN

181. A discussion of ways of meeting financial statistics for educational planning purposes is contained in Annex V since the analysis of educational finance may be considered a related exercise rather than an integral part of the preparation of an educational plan. A few remarks are, however, relevant at the present stage about the preparation of a financial plan once the estimates of required expenditures have been made. The financial parts of the educational plan should analyse the main sources of educational funds, consider the various ways in which the money for the required expenditures can be obtained, and the overall and detailed feasibility of the plan from the point of view of likely financial availability. The following paragraphs contain some brief indications of the type of consideration which is relevant in the preparation of a financial plan.

182. In the first place even if it has not been thought necessary to do it earlier it is necessary at this stage to make the distinction between public and private expenditure on education, since the educational plan is for the most part concerned with required expenditures by the public authorities. It may be noted that there is considerable overlap between public and private financing of education, since many private schools receive subsidies of one sort or another from the public sector and very often public schools receive income from various private sources.

183. When the required amount of public expenditure has been estimated it will usually be possible to make estimates of the proportion of total public expenditure that this represents. This figure may well be of more importance for the evaluation of the political feasibility of an educational plan than the more usual comparison with Gross National Product. If an increasing proportion of the Government Budget is to be devoted to education this implies an upward revision of education on the list of priorities at the expense of other public authority projects and this may well be difficult to achieve.

184. The financial plan should in any case investigate the various sources of finance available, since it may be possible to increase expenditure from some sources more rapidly than others. If the financial implications of the educational plan appear to be politically unfeasible a number of possibilities might be investigated by the planning authorities. These include :

- tapping additional sources of educational funds (other private sources, special loans for education, international aid, etc.);
- manipulation of some of the cost components which can be influenced by government policy (e.g. salaries);
- changes in some of the technical coefficients which have been used to estimate costs (e.g. student/teacher ratios, amount of equipment per pupil, number of square metres of classroom or ancillary space per pupil, etc.);
- a downward revision of the planned increase in pupil numbers, thus reducing the whole educational effort.

185. The detailed consideration of the financial aspects of the educational plan (as opposed to the estimation of required educational expenditures which have been the principal subject of the present chapter) brings the educational planner into contact with the wider implications of budgetary and fiscal policies.

186. Finally it may be mentioned that educational costs have been treated in this chapter essentially from the point of view of estimates of future educational expenditures. This is in accordance with the purpose of the handbook. It may be remarked however that the management, administration and short-term budgeting of education often requires considerably more detailed information on educational costs, expenditure and finance.

Appendix

DIRECT AND INDIRECT AID TO STUDENTS

Direct and indirect aid is an increasingly important item of educational expenditure. Owing to the diversity of such aid and the bodies which allocate it, the subject in any analysis of planned educational expenditure should be treated separately.

Pupil or student aid may either consist of a sum of money which can be freely spent by the pupil or student to whom it has been allotted (it may constitute added income when granted outright or be allocated for a specific course of study in the form of a loan repayable at the end of the course), or of certain facilities other than the strictly educational service offered free of charge or at less than actual cost.

The first case refers to direct aid, and the second to indirect aid.

Direct aid. This consists of :

— Scholarships
— Grants
— Loans
— Pre-salaries
— Other forms of aid.

Each form of aid may be allocated by different agencies : the central or regional administration and private institutions or individuals. Moreover, for each form of aid, the ratio of recipients to total pupil/student numbers is different. This is due to the often selective character of direct aid and to the varying conditions governing allocation of each type.

Forecasting direct aid expenditure consists in :

— Determining the proportion of recipients (by level and type of education);
— Estimating the average amount of aid.

In some cases allocation criteria and procedures may be used instead of estimates based on past trends in recipient ratios.

Every type of direct aid will not occur at every educational level ; loans, for example, are usually restricted to students in higher education.

Table I showing scholarships allocated to pupils and students in public education may serve as a model. A similar table should be drawn up for each type of aid granted in both public and private education.

The main purposes of direct aid are to make education accessible to children in the lower-income groups and to encourage pupils to follow branches of education they would not otherwise do. A thorough analysis should therefore include a study of the effect aid has had on the socio-economic background of pupil groups in increasing numbers in some branch of education it was desired to develop, etc.

Indirect aid. Indirect aid may often be regarded as consisting in a transfer of ordinary expenditure for pupil maintenance from the family to the public authority or to private institutions. Most of such indirect aid expenditure is used for the administration of such auxiliary educational services as school and university boarding facilities, school canteens and university restaurants, and school transportation. In some countries, indirect aid also includes such other services as the free supply of books, vocational guidance, school medical facilities, etc.

DIRECT AID

TABLE I. SCHOLARSHIPS

AMOUNTS OF GRANTS AND SCHOLARSHIPS AND NUMBER OF RECIPIENTS. PUBLIC EDUCATION[1]

Reference year :

LEVEL OF EDUCATION	TOTAL AMOUNTS GRANTED FOR SCHOLARSHIPS BY :				NUMBER OF RECIPIENTS OF SCHOLARSHIPS GRANTED BY :				RATIO OF RECIPIENTS TO TOTAL PUPILS	AVERAGE AMOUNT PER SCHOLARSHIP
	CENTRAL GOVERNMENT	REGIONAL/LOCAL AUTHORITIES	PRIVATE INSTITUTIONS	TOTAL	CENTRAL GOVERNMENT	REGIONAL/LOCAL AUTHORITIES	PRIVATE INSTITUTIONS	TOTAL		
Primary										
General secondary (a)										
General secondary (b)										
Technical (a)										
Technical (b)										
Higher[2]										
Other										

1. Similar table may be used for private education, and other forms of direct aid, such as loans.
2. Breakdown by discipline or group of disciplines.

Costs are of two kinds :

— The establishment of new services involving capital expenditure which may be very unevenly distributed over any given period and moreover requires the adoption of various technical coefficients.

— Permanent aid as represented by the administration of existing services consequently made available to a given number of recipients.

Numbers of recipients are limited by the facilities available, and an unsatisfied demand potential may therefore exist which must be allowed for in determining future ratios.

Indirect aid may be :

— Generalised : it is granted to all pupils and students, as in the case of school medical facilities and student university restaurants.

— Ungeneralised : it is granted only to pupils or students fulfilling certain conditions : income of parents below a certain level, remoteness of the establishment from the place of residence, etc.

In the former instance future expenditure will be determined by extrapolating the average cost per pupil (net of payments made by the family)). In the latter case, the proportion of pupils receiving each type of aid and the average cost per pupil (net of payments made by the family) will first have to be determined.

An inventory of existing facilities must necessarily be taken before indirect aid is analysed. Some services however operate in shifts, and there may accordingly be no direct link between the number of places and number of recipients.

Once the technical coefficients, recipient ratios and reference-year costs have been determined, the projection will be made along the lines indicated in earlier paragraphs. In extrapolating costs, account will have to be taken of changes in any of the components.

A noteworthy point is that the extent of direct and indirect aid is interrelated and also linked with educational conditions. The largely recent growth of auxiliary educational services sometimes offered at no cost to the recipient may cause a proportional decrease in the amount of scholarships or allow these to be allocated according to other criteria. The extent of aid is related to educational conditions in that scholarships may solely be used for upkeep, as in countries where education is provided entirely free of charge, while if school fees are paid by the pupil, amounts granted will primarily be used for this purpose and the rest for maintenance, and in this event either be paid to the pupil or forwarded to the teaching establishment. In this latter case such amounts should be separated from any subsidies, whether or not earmarked for other expenditure, which are received by the establishment.

TABLE II. NUMBER OF RECIPIENTS OF DIRECT AID BY OCCUPATIONAL CLASSIFICATION OF FATHER[1] AND BY LEVEL OF EDUCATION[2]

Year t

OCCUPATIONAL CLASSIFICATION OF FATHER → LEVEL OF EDUCATION ↓	1	2	3	4	5	6	7	TOTAL
Primary								
General secondary (*a*)								
General secondary (*b*)								
Technical (*a*)								
Technical (*b*)								
Higher[3]								
Other								

[1] The occupational classifications used are those of the handbook (See table 11, chapter VII).
[2] A similar table may be used for each type of direct aid.
[3] Breakdown by discipline or group of disciplines.

Basic data relating to student aid may be summarized in a few standard tables.

Direct aid. The most useful information in connection with direct aid is the following:

- Data relating to the amount of each type of aid, the allocating agency, and the number of recipients by type and level of education. These are the quantitative figures required to estimate aggregate aid and the amount per recipient, assess the pattern during a given period, and determine any trend capable of extrapolation for forecasting purposes.
- Data relating to the social pattern of the recipient group. Depending on aims, various classifications may be used. Table 2 suggests use of the socio-economic classification recommended by the handbook for other surveys.

Indirect Aid. No standard tabulation is proposed for indirect aid, as the complexity of evaluating the amounts spent annually on indirect subsidies makes such a standard layout inadequate.

Chapter VII

BASIC ELEMENTS OF A STATISTICAL TABULATION SCHEME FOR EDUCATIONAL PLANNING

INTRODUCTION

187. This chapter brings together the discussion of the previous chapters into a tabulation scheme setting out the information required for a moderately ambitious educational planning exercise that was attempting to answer questions set out in chapter I. Educational planning could be and usually is undertaken with many fewer data : conversely ambitious educational planners would seek much more information in order to estimate and verify the coefficients, to present the implications of different assumptions, and to disaggregate the plan on to a regional, local and individual school basis. Some discussion of these points occurs in the notes to the relevant tables.

188. It is clear that the precise form of the tabulation scheme in each country will depend on the structure of the educational system in that country and therefore only general recommendations about classification are made in this chapter. It should be remembered, however, that for some purposes planners will want to use internationally comparative data and that they are frequently asked to supply internationally comparative data about their own educational system, so there are advantages even in preparing national tabulation schemes in taking into account international conventions. This subject is dealt with much more fully in chapter IX, which is concerned with international comparisons. The system of classification used for illustrative purposes in the present chapter follows closely that proposed in chapter IX. It is related to the systems used by UNESCO[1] and the Council of Europe[2]. A chart in chapter IX shows this relationship.

189. It is important in establishing a national classification scheme to design the system of statistics in such a way that all courses of study which are significantly different from each other in teacher or resource requirements, or in the expectations of their pupils, are distinguished. In this way the results of all the important decisions taken by students can be investigated. Information about teachers, buildings and equipment, finance and expenditure, adult educational attainment, etc., should be as closely related as possible with the information on pupils. This is vital for the calculation

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[1] Manual of Educational Statistics (UNESCO, Paris 1961).
[2] School Systems — A Guide (Council of Europe, Strasbourg 1965).

of coefficients to estimate the necessary resource inputs into education, and to link in so far as is possible, outflows from the educational system to existing stocks of educated people. It is also important that information on all « types of institutions », public and private, be shown. Where the data are not readily available for some types of institution special efforts should be made.

190. It should be noted that many of the tables referred to in this chapter as single tables are likely to be, in fact, a set of tables if they are to contain all the information suggested.

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Table 1

POPULATION AGED 0-35 BY INDIVIDUAL YEAR OF AGE AND SEX (CURRENT YEAR AND FORECASTS)

191. This table should use the convention of presenting high, medium and low demographic forecasts, depending on different assumptions about births, deaths, immigration and emigration.

192. Ideally, the table should be available for school districts. It should certainly be available by major economic region, when internal migration is important. Demographic forecasts are among the principal factors to be taken into consideration when a particular school is being built.

193. The frequency with which the table is produced will depend on the amount of demographic forecasting done by the country. However, the educational planner should adjust the national figures annually in the light of births, deaths, immigrants and emigrants actually recorded during the preceding year. The detailed breakdown by school district may be possible only at longer intervals and will probably be made on a more ad hoc basis depending on planning requirements.

194. Where this table is not produced by other authorities, nationally or locally, it will be necessary for the educational planner to prepare it — either from less detailed demographic forecasts that do exist, or by making his own forecasts, from current population data[1].

195. Such a table showing the total potential clientele of the educational system is clearly fundamental to any exercise in educational planning.

Table 2

EDUCATIONAL INSTITUTIONS BY LEVEL, SIZE AND TYPE, TEACHERS AND ENROLMENT

196. The educational institution is the fundamental unit in educational planning for a number of reasons. In the first place, it is within the educational institution that instruction actually takes place, and the characteristics of the institution — size, number and quality of teachers, location, etc. — strongly influence the type and quality of instruction given to the pupils. The importance of information on the characteristics of educational institu-

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[1] Cf. Report on *Investment in Education in Ireland* (op. cit.).

TABLE 1. POPULATION AGED 0-35 BY INDIVIDUAL YEAR OF AGE AND SEX (CURRENT YEAR AND FORECASTS)

POPULATION AGED	CURRENT YEAR (×)			(× + 5) YEARS			(× + 10) YEARS			(× + 15) YEARS			(× + 20) YEARS		
	MALE	FEMALE	TOTAL	MALE	FEMALE	TOTAL	MALE	FEMALE	TOTAL	MALE	FEMALE	TOTAL	MALE	FEMALE	TOTAL
Less than 1 year															
From 1 — 2 years....															
2 — 3 »															
3 — 4 »															
4 — 5 »															
5 — 6 »															
6 — 7 »															
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34 — 35 »															

TABLE 2. EDUCATIONAL INSTITUTIONS BY LEVEL, SIZE AND TYPE, TEACHERS AND ENROLMENT

LEVEL, SIZE AND TYPE OF INSTITUTION	NUMBER OF INSTITUTIONS	TOTAL PUPILS ENROLLED				TEACHERS				NUMBER OF INSTITUTIONS NOT OFFERING FULL RANGE OF CURRICULUM CORRESPONDING TO SCHOOL TYPE	NUMBER OF PUPILS ENROLLED IN THESE INSTITUTIONS
		MALE		FEMALE		MALE		FEMALE			
		FULL-TIME	PART-TIME	FULL-TIME	PART-TIME	FULL-TIME	PART-TIME	FULL-TIME	PART-TIME		
Pre-primary :											
Enrolment : less than 50											
51 to 100											
101 to 200											
201 to 300											
etc.											
Primary :											
Enrolment : less than 50											
51 to 100											
101 to 200											
201 to 300											
etc.											
Secondary general :											
Enrolment : less than 50											
51 to 100											
101 to 200											
201 to 300											
etc.											
Technical, vocational :											
Enrolment : less than 50											
51 to 100											
101 to 200											
201 to 300											
etc.											
Higher :											
Universities											
Equivalent (degree-granting institutions)											
Other											
Other (specify)											
Total											

tions for forecasting and planning purposes has been stressed in chapter III. The second main reason for the importance of educational institutions is that for many purposes it is the institution, considered as an administrative unit, which is the basic reporting unit for educational statistics. The establishment passes on information about its pupils, teachers, equipment, etc. to local and central government authorities. On the basis of information received, the authorities formulate and implement educational policies, which only become effective when they are fully applied at the level of the individual educational institution. For both these reasons, therefore, it is important that any system of educational statistics accord a high priority to information on the characteristics of institutions.

197. The table which is illustrated here shows the total number of institutions of each type classified by number of pupils enrolled. This is important because of the pedagogic disadvantages of small schools where pupils of different grades and ages are taught in the same classroom, and the financial implications for school construction, of having a widely dispersed school population. This measure of size may be replaced in the tabulation by a measure of school size in terms of number of classes. In the present context, the concept of « class » is used in the sense of the UNESCO definition, i.e. a group of pupils who are usually instructed together. For many purposes a more detailed breakdown of institutions would be necessary, showing in particular their location, whether urban or rural, public or private, etc. For each of these categories of institutions, information should be available on the number of institutions, the total enrolment and the total number of teachers. The pupils enrolled and the teachers should be distinguished by sex and whether they are part-time or full-time. Further subdivisions of this basic table can be made to show the age of pupils in each category of institution and also the number of pupils in each grade, where relevant. This particular subject is further treated in table 9. This table will also be used for the calculation of crude pupil/teacher ratios. A more sophisticated treatment of pupil/teacher ratios is considered in the context of table 13.

198. As grades are not introduced directly into this table, it is suggested that the number of institutions not providing the normal curriculum range associated with an institution of the given type be separately enumerated. The corresponding number of pupils enrolled should also be given. What this means in practice is the following: if in a particular country primary education covers six grades, usually completed by pupils in six years, but in rural areas 4-year schools only are available, the rural school is not providing the full range of educational activity associated with that particular school type. This information is of particular interest for small rural schools.

Concerning a definition of an educational institution, a distinction should be made between a « school establishment » (administrative unit), a « school building » (a physical unit), and a « school » composed of a group of pupils — *suitably defined* as an instructional unit (UNESCO).

199. In the case of this table, the relevant definition would be the school establishment — although a university may have several schools, faculties, buildings, etc., it should be listed once only. It is the *administrative units* that are being counted here.

PUPIL STOCK AND FLOW STATISTICS

Introduction to Tables 3, 4, 5 and 6

200. An earlier chapter[1] has discussed the importance of flow statistics. In the following tables a tabulation scheme for presenting flow data is outlined. In order to simplify the tables and to reduce the number of cells the whole educational system is not presented in detail in one single table. In table 3 only movements of persons into the educational system either as pupils or teachers, and their movements outside the system are shown. This is meant mainly to illustrate the scheme underlying the other detailed flow tables. The educational system in disaggregated, as far as is possible, by level, grade and orientation of education in the later flow tables. Detailed notes appear alongside each.

201. It should be noted that stocks of pupils and teachers in two successive years are shown by the row and column totals. This presentation has been chosen deliberately to emphasise the importance of working towards the availability of complete flow data. Even in countries, where at present, the flow matrices cannot be completed, the traditional stock data that are available can be entered in the relevant row and column totals, and some of the intermediate flows can be estimated[2].

202. The tables illustrated show both full-time and part-time pupils since there is often considerable movement of pupils between full-time and part-time education. This makes the flow matrix more difficult to articulate, but if valid transition coefficients are to be calculated, these movements must be shown.

203. As part-time students and teachers are shown in the tables, there could be a problem of double-counting. Pupils who study part-time may also be members of the labour force. Teachers may be part-time students or have another occupation besides teaching. In order to avoid counting people twice, the flow tables distinguish three categories of people. These three categories cover the entire population of the country. They are :

1. Persons who are in the educational sector, full-time or part-time and who are not in the active labour force (full-time and part-time pupils are distinguished).
2. Persons who are part-time in the educational sector, and in the labour force.
3. Persons who are not in educational sector.

Any person enrolled full-time or part-time in a recognised course of education is considered as being in the « educational sector ».

204. In all of these tables « Other Education » is a residual block, considering all levels and kinds of education not listed explicitly in the rows and columns. This has been done to simplify the tables, to avoid showing unlikely or impossible transfers and to ensure complete coverage.

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[1] See chapter II

[2] See Appendix to chapter VIII for a note on the compilation of flow tabulations in the absence of individualised data.

TABLE 3. TOTAL POPULATION FLOWS INTO AND OUT OF THE EDUCATIONAL SECTOR

GENERAL FRAMEWORK FOR FLOW STATISTICS

DESTINATION t_1 →			EDUCATIONAL SECTOR ONLY				PART-TIME EDUCATION IN LABOUR FORCE		NOT IN EDUCATIONAL SECTOR (EMIGRATION, DEATH, ETC....)	TOTAL TIME PERIOD t_0
			PUPILS		TEACHERS		PUPILS	TEACHERS		
ORIGIN t_0 ↓			FULL-TIME	PART-TIME	FULL-TIME	PART-TIME				
EDUCATIONAL SECTOR ONLY	PUPILS	FULL-TIME								
		PART-TIME								
	TEACHERS	FULL-TIME								
		PART-TIME								
PART-TIME EDUCATION IN LABOUR FORCE		PUPILS								
		TEACHERS								
OUT OF EDUCATIONAL SECTOR (BIRTHS, IMMIGRATION, ETC....)										
TOTAL TIME PERIOD t_1										

Table 4. NUMBERS OF PUPILS AND MOVEMENTS O

DESTINATION η_j → ORIGIN η_i ↓	PRE-PRIMARY	FULL-TIME				
		PRIMARY				
		GRADE 1	GRADE 2	GRADE 3	GRADE 4	GRADE 5
Pre-primary						
FULL-TIME IN EDUCATIONAL SECTOR :						
Primary :						
Grade 1						
Grade 2						
Grade 3						
Grade 4						
Grade 5						
Grade 6						
Grade 7						
Grade 8						
Etc.						
Other education						
PART-TIME IN EDUCATIONAL SECTOR :						
Not in the labour force :						
Primary						
Other education						
In the labour force :						
Primary						
Other education						
NOT IN EDUCATIONAL SECTOR :						
Below school age						
Immigration						
Active labour force						
Economically inactive						
Total η_j						

Type « a » is education from which the probability of continuing to higher education is relatively high.

Type « b » is education from which the probability of continuing to higher education is relatively low.

…PILS INTO, WITHIN AND OUT OF PRIMARY EDUCATION

…CATIONAL SECTOR							PART-TIME IN EDUCATIONAL SECTOR												OUT OF EDUCATIONAL SECTOR				TOTAL IN %
		SECONDARY				OTHER EDUCATION	OUT OF THE LABOUR FORCE						IN THE LABOUR FORCE										
GRADE 6	ETC...	GENERAL (a)	GENERAL (b)	TECHNICAL AND VOCATIONAL (a)	TECHNICAL AND VOCATIONAL (b)		PRIMARY	SEC. GENERAL (a)	SEC. GENERAL (b)	SEC. TECHNICAL AND VOCATIONAL (a)	SEC. TECHNICAL AND VOCATIONAL (b)	OTHER EDUCATION	PRIMARY	SEC. GENERAL (a)	SEC. GENERAL (b)	SEC. TECHNICAL AND VOCATIONAL (a)	SEC. TECHNICAL AND VOCATIONAL (b)	OTHER EDUCATION	[illegible]	[illegible]	[illegible]	[illegible]	

Table 4

NUMBERS OF PUPILS AND MOVEMENTS OF PUPILS INTO, WITHIN AND OUT OF PRIMARY EDUCATION

205. This table shows numbers of pupils in primary education by grade in two consecutive time periods, and the detailed movements of pupils between these two time periods. It can be considered as a highly magnified part of the global picture shown in the previous table. All movements between different grades within primary education are shown, but secondary education and the non-educational sector into which pupils move from primary education, are not broken down in detail.

206. As part-time primary education, when it exists, is usually for adults held in evening classes or the like, a breakdown by grade is often difficult and not very meaningful, and it is therefore shown here without distinction by grade.

207. This table can be used for calculating transition coefficients from grade to grade in primary education, and from primary education to other types of education and other activities. It provides a starting point for the analysis of course repeating. The detailed analysis by grades will not be so important for countries where progress through primary school is fairly ordered and promotion more or less automatic. The transitions from primary education to the different streams of secondary education are, however, important in many educational systems. The row and column totals show the stocks of pupils in each grade of primary education in two successive years.

Table 5

NUMBERS OF PUPILS AND MOVEMENTS OF PUPILS INTO, WITHIN AND OUT OF SECONDARY EDUCATION

208. The principle of this table is the same as that of the preceding one. Here secondary education has been magnified, and the important movements within it are highlighted.

209. In the previous table persons leaving primary education were shown simply as entering « general secondary » education, etc. Here the grade in which they enter will be seen.

210. An effort has been made to distinguish the different types of secondary education. This leads to the basic distinction between « general » and « technical and vocational » education. This is not considered enough for educational planners, as in many countries the type of secondary school a pupil enters has a determining effect on the likelihood of going on to higher education. Although the tabulations shown here are only illustrative, it is considered important that this point should be stressed. For this reason, all secondary education has been shown as being of type (a) or (b). The difference between the two is that the system is so structured that pupils in institutions of type (a) have a greater probability of proceeding to an institution of higher education. This corresponds with the educational system in many OECD countries, though in some cases (a) and (b) would

EDUCATION

PART-TIME IN EDUCATIONAL SECTOR												NOT IN EDUCATIONAL SECTOR				TOTAL %
NOT IN LABOUR FORCE						IN LABOUR FORCE										
GENERAL (α)	GENERAL (β)	TECHNICAL VOC. (α)	TECHNICAL VOC. (β)	HIGHER ED.	OTHER ED.	GENERAL (α)	GENERAL (β)	TECHNICAL VOC. (α)	TECHNICAL VOC. (β)	HIGHER ED.	OTHER ED.	DEATHS	EMIGRATION	ACTIVE LABOUR FORCE	NON-ACTIVE	

TABLE 5. NUMBERS OF PUPILS AND MOVEMENTS OF PU

DESTINATION i_2 → ORIGIN i_1 ↓	FULL-TIME IN EDUCATIONA														
	PRIMARY	SECONDARY													
		GENERAL (a)							GENERAL (b)							VOCA
		GRADE 1	GRADE 2	GRADE 3	GRADE 4	GRADE 5	GRADE 6	ETC.	GRADE 1	GRADE 2	GRADE 3	GRADE 4	GRADE 5	GRADE 6	ETC.	GRADE 1
FULL-TIME IN EDUCATIONAL SECTOR :																
Primary																
Secondary : General (a) :																
Grade 1																
Grade 2																
Grade 3																
Grade 4																
Grade 5																
Grade 6																
Etc.																
General (b) :																
Grade 1																
Grade 2																
Grade 3																
Grade 4																
Grade 5																
Grade 6																
Etc.																
Vocational, Technical (a) :																
Grade 1																
Grade 2																
Grade 3																
Grade 4																
Etc.																
Vocational, Technical (b) :																
Grade 1																
Grade 2																
Grade 3																
Grade 4																
Etc.																
Other Education																
PART-TIME IN EDUCATIONAL SECTOR :																
Not in Labour Force :																
General (a)																
General (b)																
Vocational, technical (a)																
Vocational, technical (b)																
Other Education																
In Labour Force :																
General (a)																
General (b)																
Vocational, technical (a)																
Vocational technical (b)																
Other Education																
NOT IN EDUCATIONAL SECTOR :																
Births																
Immigration																
Active labour force																
Inactive																
Total i_2																

Type « a » is education from which the probability of continuing to higher education is relatively high.
Type « b » is education from which the probability of continuing to higher education is relatively low.

PILS INTO, WITHIN AND OUT OF SECONDARY EDUCATION

L SECTOR													PART-TIME IN EDUCATIONAL SECTOR												NOT IN EDUCATIONAL SECTOR				TOTAL t_0
									HIGHER				NOT IN LABOUR FORCE						IN LABOUR FORCE										
TIONAL, TECHNICAL (a)				VOCATIONAL, TECHNICAL (b)																									
GRADE 2	GRADE 3	GRADE 4	ETC.	GRADE 1	GRADE 2	GRADE 3	GRADE 4	ETC.	UNIVERSITIES	EQUIV. DEGREE	OTHER HIGHER EDUCATION	[illegible]	GENERAL (a)	GENERAL (b)	TECHNICAL VOC. (a)	TECHNICAL VOC. (b)	HIGHER ED.	OTHER ED.	GENERAL (a)	GENERAL (b)	TECHNICAL VOC. (a)	TECHNICAL VOC. (b)	HIGHER ED.	OTHER ED.	DEATHS	EMIGRATION	ACTIVE LABOUR FORCE	ECON. INACTIVE	

rities should decide how to incorporate these into the tabulation scheme. It is particularly important that part-time students be distinguished where :

i) their rates of dropout, average duration of studies or success rates in examinations differ markedly from those of full-time students ;

ii) because of irregular or infrequent attendance at educational institutions, their resource requirements in terms of teachers, equipment, etc., differ from those of full-time students.

TABLES 6 AND 7

NEW ENTRANTS BY ORIGIN, AND NUMBER OF STUDENTS IN HIGHER EDUCATION

215. The main purpose of the first columns of table 6 is to illustrate the connection between the completion of secondary education and entry into institutions of higher education. It shows the immediate educational origin of new entrants into each field of study. In many countries the completion of secondary education requires the passing of an examination which offers students several options. In such cases, a straightforward extension of the table can permit the educational origin of new entrants into each field of study to be compared with the option they took in the secondary level completion examination. This provides a useful short-term indicator of the number of places that will be sought in each field of study. This part of the table also shows the origin of students who do not come directly from the educational system.

216. The second part of this table suggests a detailed breakdown of the stock of students by their field of study and by the type of qualification for which they are studying. The table breaks qualifications down into three types.

a) Qualifications that are considered to be below the standard of a first degree.

b) First degree and equivalent qualifications.

c) Post-graduate qualifications.

The precise interpretation of these three types of qualifications and perhaps the inclusion of others, must depend upon national authorities. The classification used here is similar to that proposed for international comparisons in chapter IX where it is further explained.

217. Foreign students should be separately distinguished as an indication of the provision that the national system is making, and should make, for students from abroad. No proposals are made in the present tabulation scheme for classifying foreign students by their country of origin, as this information is not of very high priority for specifically national educational planning. In the international context, however, such information is very important and national authorities are strongly urged to collect the information on numbers of students enrolled and qualifications obtained, by field of study and by country of origin, of foreign students that is suggested in table D of chapter IX. Table 7 shows numbers of foreign students and graduates by field of study. Figures of enrolments of national students can be obtained by subtracting the figures in this table from those in the relevant column of table 6.

TABLE 6. EDUCATIONAL BACKGROUND AND ORIGIN OF NE
TYPE O

ALL STUDENT

FIELD OF STUDY	NEW ENTRAN									
	FULL-TIME EDUCATION					PART-TI				
						IN THE LABOUR FORCE				
	GENERAL SECON-DARY		TECH-NICAL AND VOC.		OTHER EDUCATION	GENERAL SECON-DARY		TECH-NICAL AND VOC.		OTHER EDUCATION
	(a)	(b)	(a)	(b)		(a)	(b)	(a)	(b)	
I. UNIVERSITIES AND EQUIVALENT DEGREE-GARANTING INSTITUTIONS :										
1. *Pure Sciences* :										
Astronomy										
Bacteriology										
Biochemistry										
Biology										
Botany										
Chemistry										
Entomology										
Geology										
Geophysics										
Mathematics										
Meteorology										
Mineralogy										
Physics										
Zoology										
Others										
2. *Architecture*										
3. *Technology* :										
Applied Sciences										
Construction										
Geodesy										
Metallurgy										
Mining										
Surveying										
Technology										
Textile Engineering										
Others										
4. *Medical Sciences* :										
Anatomy										
Dentistry										
Medicine										
Midwifery										
Nursing										
Optometry										
Osteopathy										

---

[1] Persons entering higher education for the first time.

NTRANTS[1] INTO HIGHER EDUCATION, TOTAL ENROLMENT BY OURSE

ATIONAL AND FOREIGN

OMING FROM :									TOTAL NEW ENTRANTS	ENROLLED STUDENTS BY TYPE OF COURSE FOLLOWED			TOTAL ENROLMENT
UCATION					OTHER ACTIVITIES								
OT IN THE LABOUR FORCE					LABOUR FORCE	INACTIVE POPULATION	FROM ABROAD	OTHER ORIGIN		BELOW LEVEL OF A FIRST DEGREE	COURSES LEADING TO [illegible] DEGREE	POST GRADUATE COURSES	
GENERAL SECOND-ARY		TECH-NICAL AND VOC.		OTHER EDUCATION									
[illegible]	[illegible]	[illegible]	[illegible]										

Continued pages [illegible] →

TABLE 6 (Cont'd). EDUCATIONAL BACKGROUND AND ORIGIN O
BY TYP

ALL STUDENT

FIELD OF STUDY	NEW ENTRANTS										
	FULL-TIME EDUCATION					PART-TI					
	[illegible]		[illegible]		[illegible]	IN THE LABOUR FORCE					
						[illegible]		[illegible]		[illegible]	
	(a)	(b)	(a)	(b)		(a)	(b)	(a)	(b)		
Pharmacy											
Physiotherapy											
Public Health											
Surgery											
Others											
5. *Agriculture* :											
Agricultural biological Sciences											
Agricultural economics											
Agricultural physical Sciences											
Animal husbandry											
Crop husbandry											
Dairy farming											
Fisheries											
Food Technology											
Forestry											
Horticulture											
Veterinary medicine											
Others											
6. *Humanities* :											
Archeology											
History											
Languages											
Library Science											
Literature											
Philosophy											
Psychology											
Theology											
Others											
7. *Fine Arts* :											
Drawing											
Music											
Painting											
Sculpture											
Speech and dramatic art											
Others											
8. *Education* :											
Education											

1. Persons entering higher education for the first time.

…EW ENTRANTS¹ INTO HIGHER EDUCATION, TOTAL ENROLMENT …F COURSE

…TIONAL AND FOREIGN

…MING FROM :									TOTAL NEW ENTRANTS	ENROLLED STUDENTS BY TYPE OF COURSE FOLLOWED			TOTAL ENROLMENT
…CATION					OTHER ACTIVITIES								
…T IN THE LABOUR FORCE					LABOUR FORCE	INACTIVE POPULATION	FROM ABROAD	OTHER ORIGIN		BELOW LEVEL OF A FIRST DEGREE	COURSES LEADING TO A DEGREE	POST GRADUATE COURSES	
…SECOND-ARY		TECH-NICAL [illegible]		OTHER EDUCATION									
…	(b)	(a)	(b)										

Continued pages [illegible], [illegible] →

TABLE 6 (*Cont'd*). EDUCATIONAL BACKGROUND AND ORIGIN
BY TY

ALL STUDEN

FIELD OF STUDY	NEW ENTRA									
	FULL-TIME EDUCATION					PART-T				
						IN THE LABOUR FORC				
	GENERAL SECON-DARY		TECH-NICAL AND VOC.		OTHER EDUCATION	GENERAL SECON-DARY		TECH-NICAL AND VOC.		OTHER
	(a)	(b)	(a)	(b)		(a)	(b)	(a)	(b)	
Pedagogy										
Physical education										
9. *Law*										
10. *Social Sciences* :										
Banking										
Commerce										
Diplomacy										
Economics										
Ethnology										
Geography										
Home Economics										
International Relations										
Journalism										
Political Science										
Public Administration										
Social Welfare										
Sociology										
Statistics										
Others										
11. *Others* (n. e. c.)										
Total universities and equivalent										
II. OTHER — HIGHER EDUCATION (SAME BREAKDOWN AS ABOVE) :										
Total										

1. Persons entering higher education for the first time.

W ENTRANTS[1] INTO HIGHER EDUCATION, TOTAL ENROLMENT COURSE

TIONAL AND FOREIGN

ING FROM :									TOTAL NEW ENTRANTS	ENROLLED STUDENTS BY TYPE OF COURSE FOLLOWED			TOTAL ENROLMENT
CATION				OTHER ACTIVITIES									
T IN THE LABOUR FORCE				LABOUR FORCE	INACTIVE POPULATION	FROM ABROAD	OTHER ORIGIN			BELOW LEVEL OF A FIRST DEGREE	COURSES LEADING TO A DEGREE	POST GRADUATE STUDIES	
SECOND-ARY	TECHNICAL, VOCATIONAL		OTHER INSTITUTIONS										
(b)	(a)	(b)											

TABLE 7. FOREIGN STUDENTS IN HIGHER EDUCATION

FIELD OF STUDY ↓ FOREIGN STUDENTS ENROLLED →	TOTAL ENROLMENT	GRADUATES
Universities and Equivalent Degree-granting Institutions :		
Pure Sciences		
Architecture		
Technology		
Medical Science		
Agriculture		
Humanities		
Fine Arts		
Education		
Law		
Social Sciences		
Other		
Total		
Other Institutions of Higher Education :		
Pure Sciences		
Architecture		
Technology		
Medical Science		
Agriculture		
Humanities		
Fine Arts		
Education		
Law		
Social Sciences		
Other		
Total		

NOTES : 1. New entrants from abroad are shown in the previous table.
2. It may be considered desirable to use the same detailed breakdown of subject specialisation as table 6.

TABLE 8
STUDENT PROGRESS IN HIGHER EDUCATION

218. In higher education it is often important to know how long students take to obtain their qualifications, how often and at what stage they repeat years of study, and how many students drop out of the educational system without obtaining a qualification. The best way to obtain this kind of information is to study students entering the system for the first time, and to trace their progress through the higher educational system, until they have all left it. This means using the demographic technique of cohort analysis.

219. The relationships between prescribed length of studies, actual length of studies and numbers and pattern of drop-outs are illustrated in diagram 1, which shows the numbers of students in a particular year in three possible university systems, in which the normal duration of the course of study is assumed to be four years.

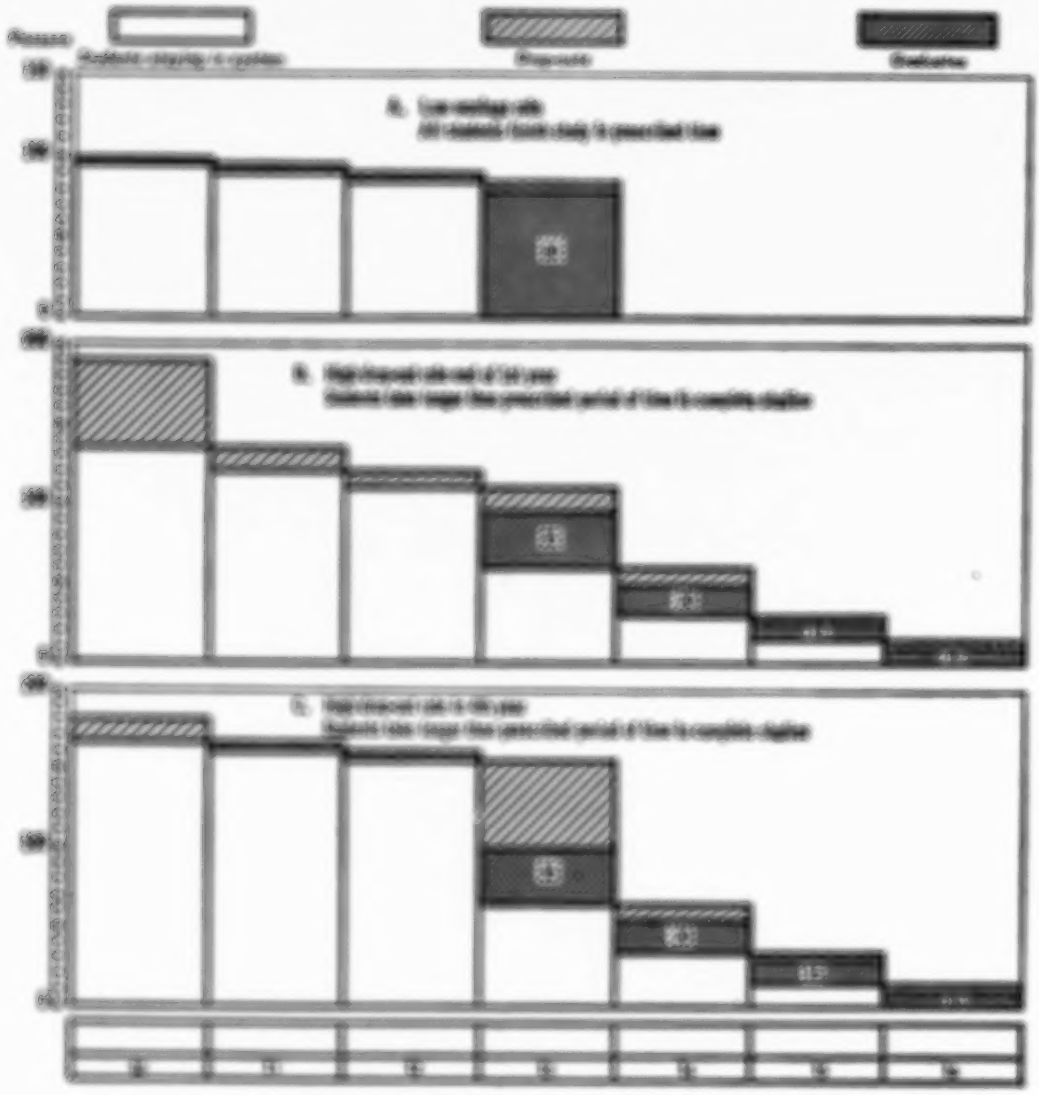
220. The interpretation of the diagram is as follows. Along the horizontal axis is shown the year of study of students. Along the vertical axis

is shown numbers of students in any particular year of study. The total area of all the blocks, including all the shaded parts shows, therefore, the total number of students in a given year. The lightly shaded parts show the number of drop-outs from each year of study ; the heavily shaded parts show the number of graduates. The area of these heavily shaded parts, i.e. graduates, is the same in all three diagrams.

221. From the point of view of number of new entrants and students required to produce a given number of graduates, university system « A » can be said to be the most efficient. There is little drop-out, and all students complete the course in the prescribed period.

222. University system « B » has a high rate of entry but a large number of drop-outs at the end of the first year, and many students take longer than the minimum period of study to complete the course.

Diagram 1. RELATIONSHIP BETWEEN NEW ENTRANTS, LENGTH OF COURSE, DROP-OUTS AND STUDENTS



NUMERICAL IMPLICATIONS OF DIAGRAM I

	CASE A	CASE B	CASE C
Number of Students Entering the System in the Same Year (Cohort) :			
1st year	[illegible]	[illegible]	[illegible]
2nd year	[illegible]	[illegible]	[illegible]
3rd year	[illegible]	[illegible]	[illegible]
4th year	[illegible]	[illegible]	[illegible]
5th year	—	[illegible]	[illegible]
6th year	—	[illegible]	[illegible]
7th year	—	[illegible]	[illegible]
Total Number of Student Years[1]	[illegible]	[illegible]	[illegible]
Number of Graduates	[illegible]	[illegible]	[illegible]
Mean student years per graduate	[illegible]	[illegible]	[illegible]
Number of graduates per 100 new entrants	[illegible]	[illegible]	[illegible]

[1] *Number of students multiplied by number of years they are in the system.*

223. System « C » has few drop-outs during the course, but a high rate of failure at the final examinations, as a result of which, many students drop out in that year and others take longer than the minimum prescribed period to complete the course.

224. It can clearly be seen that the coefficients relating new entrants, total number of students enrolled and graduates is very different in the

Table 6a. STUDENT PROGRESS

PROGRESS OF COHORT → FIELD OF STUDY ↓	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Pure sciences						
Architecture						
Technology						
Medical science						
Agriculture						
Humanities						
Fine arts						
Education						
Law						
Social sciences						
Other fields						
Total - All fields of study						

A « year of study » refers to a stage of this education normally covered in a year, even if higher education is not organised in years of study.

three systems. They are shown in the numerical example that follows diagram I. Other combinations than those illustrated are, of course, possible particularly if different prescribed course lengths are also taken into account.

225. The above table showing the numerical implications of diagram I, indicates that the structure and organisation of higher education has profound repercussions on resource requirements of the educational system. To produce 80 graduates, system A required 100 new entrants, and 570 student years. System B required 130 new entrants and 660 student years. System C required 100 new entrants and 775 student years. The average number of student years per graduate is 7.1, 8.2 and 9.7 respectively. At first sight, it might seem that system C had a higher productivity than system B, 80 % of its new entrants having graduated, as opposed to 62 % of those of system B. However, it has produced 80 graduates in 775 student years, whereas system B has used 660 student years « only ».

226. To obtain the information required for this type of analysis Table 8 proposes that cohorts of entrants into higher education be followed year by year until they have all left the system. Repeaters, drop-outs, transfers, graduates are studied each year, so that indicators such as « number of student-years required to produce a graduate » may be obtained.

227. Though the idea of cohort analysis may not be new, the statistical machinery required to make the information proposed in this table available, may not be easy to set up. In Annex III, the Electronic Data Processing machinery set up by Germany is described, and with this type of arrangement

HIGHER EDUCATION

[illegible]						[illegible]						[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]				
			[illegible]	[illegible]	[illegible]				[illegible]	[illegible]	[illegible]		

In countries where higher education is organised in semesters, this table should use the unit of a semester, and not a year.

tables 8a and 8b can be produced over time. Data can also be obtained from samples, special surveys, etc.

228. Table 8a shows students year by year, and when they have all left the system, a summary table, such as is proposed in table 8b, can be constructed.

Among their many uses, these tables can :

a) Indicate rate of student progress through various stages of higher education.

b) Compare actual duration of study with prescribed duration of study.

c) Study the stage at which drop-outs (e.g. after 1st year, or in final year) take place.

d) Compare the prescribed and actual duration of study for different fields of study.

229. It will not be necessary to study a cohort of new entrants into 1st year, every year ; every five years will probably be adequate.

230. Initially, efforts should be made to obtain these tables for university and equivalent degree-granting institutions. At a later stage it would be desirable to include other institutions of higher education, and even pupils enrolled in primary and secondary education.

231. Some cohort analysis can be undertaken without the necessity of following a whole intake cohort throughout its whole higher educational career. On the one hand data from a sample of the group can provide the necessary information ; on the other the « matching » of students at different stages of higher education from ordinary flow data for two successive years can permit an artificial cohort to be created.

Table 9

ENROLMENT BY AGE, GRADE AND TYPE OF EDUCATION

232. This table is fundamental, even where detailed flow tabulations exist. It gives preliminary indications on the following topics : —

1. calculation of enrolment ratios ;
2. study of retardation ;
3. indication of how long pupils stay in the educational system ;
4. the participation of adults in education.

In the flow matrix it is possible to identify pupils who repeat more than once without extremely complex tabulations. This table, by showing pupils' ages and the stage of education they have reached, makes it possible to estimate accumulated retardation. The assumption that requirements for buildings, teachers, text books, finance, etc., in different branches of education are simply related to the grade in which pupils should be at a certain age can be very misleading. If many pupils remain in grades more than one year, the resource requirements in the lower grades may be much higher than those suggested by demographic forecasts.

233. A phenomenon that is of growing interest to educational planners, is the return of older persons to the educational system. In a tabulation

TABLE 46. STUDENT PROGRESS IN HIGHER EDUCATION
Summary table

FIELD OF STUDY → PROGRESS OF STUDENTS ↓	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	LAW	[illegible]	[illegible]	[illegible]
Number of New Entrants to												
First-time registration												
Obtained Degree — Total												
After 1 year of study												
" 2 "												
" 3 "												
" 4 "												
" 5 etc. "												
Dropped Out — Total												
After 1 year of study												
" 2 "												
" 3 "												
" 4 "												
" 5 etc. "												
Still Studying — Total												
Without retardation												
Retarded												
Transferred — Total												
After 1 year of study												
" 2 "												
" 3 "												
" 4 "												
" 5 etc. "												

New Entrants: Registrants for the first time are not included. Those belonging to another cohort, generally those of the preceding year.
Transfers: In this table, transfers includes only those transferring to another field of study and not to other institutions, where the same field of study is pursued.
Drop-outs: If identification techniques permit, students who drop out and subsequently re-enter should be distinguished and their original cohorts [illegible] so that the years in which they are out of the educational system are not included among years of study.
This information might be disaggregated by specific degree for which students are preparing, as well as field of study, and individual characteristics of pupils.

scheme that does not show the age of pupils it is difficult to know the extent of this development. A table such as that suggested here would show persons at various ages who study part-time in different types of education.

224. Combined with the population table by individual year of age, the table can show at what ages pupils leave the educational system. In addition to the overall enrolment ratio, the table would show the proportion of a given age who are (a) full-time in education, (b) part-time in education, and (c) not receiving any education.

225. Until complete flow data are available, showing all possible movements into, between and out of education, a table showing enrolment by

Table 9. ENROLMENT BY AGE, GRADE AND TYPE OF EDUCATION

FULL-TIME IN EDUCATIONAL SECTOR						EDUCATION
SECONDARY				HIGHER		OUT OF LABOUR FORCE
[illegible]	GENERAL (2)	TECHNICAL-VOCATIONAL (2)	TECHNICAL-VOCATIONAL (3)	UNIVERSITY AND EQUIVALENT	OTHER HIGHER	SECONDARY

D TYPE OF EDUCATION

grade and age can on certain assumptions give an indication of flows that have taken place. As all persons aged (n) in a given year will be aged (n + 1) the following year, by comparing the enrolments of persons aged (n) with those of persons aged (n + 1) the following year, some idea can be had of the number of repeaters, transfers, leavers, etc. Of course, it will not be possible to distinguish between persons entering at different ages from those who have remained in the system from the previous year.

TABLE 10
EXAMINATION RESULTS AND DEGREES, DIPLOMAS AND OTHER QUALIFICATIONS AWARDED

236. An important factor affecting transition coefficients from one level or type of education to another is performance in an examination giving access to the next stage of education. Furthermore although education can be considered as an end in itself, the educational system does provide society with persons having different types of qualifications and one indication of whether the system is achieving its own ends is the number of students who succeed in obtaining different types of diplomas.

237. Theoretically this information could be integrated directly into the flow tables. It has not been done here, because in a general table it is not possible to show all important points at which examinations take place, or instances where qualifications are awarded. To do this would require a table, disaggregated to such a level, that every stage of education where an examination takes place, or qualification is awarded, would be shown. This would be a very cumbersome procedure. It is considered preferable to produce one table where all the required information can be presented together. This table should include all examinations that are relevant to a pupil's progress through the educational system, or to the final stage of a level or type of education. When used in conjunction with the flow tables, this information will help to explain some of the movements from one stage of education to another. Entry examinations as well as completion examinations should be included. For access to some kinds of higher education satisfying a minimum entry requirement is not sufficient, but a particular examination must be passed also ; these examinations should be taken into account.

238. Listing the name of the examination or degree, certificate, is not sufficient. Where options or fields of study can be differentiated, they should be. For example, the examination taken on completion of secondary education in Sweden giving access to higher education (Studentexamen), is taken in one of the following options, which is highly correlated with the field of study later chosen by students when they proceed to higher education :

Allmän linje	(general course, subdivided to show those taking the språklig – languages course, and those taking the social gren – social studies course) ;
Latinlinje	(Latin studies, subdivided to show those taking the halvklassisk – strongly emphasizing Latin and French, and helklassisk – strongly emphasizing Latin and Greek) ;

TABLE 10. EXAMINATION RESULTS AND DEGREES, DIPLOMAS AND OTHER QUALIFICATIONS AWARDED

DIPLOMAS, CERTIFICATES, QUALIFICATIONS, EXAMINATIONS		FURTHER SPECIFICATIONS	NO. OF PUPILS OR STUDENTS	
			ENTERED	SUCCESSFUL
Primary Education	Total		[illegible]	[illegible]
Certificat d'études primaires	[illegible]	boys	[illegible]	[illegible]
		girls	[illegible]	[illegible]
Certificat d'études primaires pour adultes	[illegible]	men	[illegible]	[illegible]
		women	[illegible]	[illegible]
Secondary Education – general (I)	Total		[illegible]	[illegible]
Brevet élémentaire	[illegible]	boys	[illegible]	[illegible]
		girls	[illegible]	[illegible]
Brevet d'études du premier cycle	[illegible]	boys	[illegible]	[illegible]
		girls	[illegible]	[illegible]
Secondary Education – general (II)	Total		[illegible]	[illegible]
Baccalauréat		philosophy	[illegible]	[illegible]
"		sciences	[illegible]	[illegible]
"		mathematics	[illegible]	[illegible]
"		applied science	[illegible]	[illegible]
"		economics	[illegible]	[illegible]
Secondary Education – technical (I)	Total		..	[illegible]
Certificat d'aptitude professionnelle	[illegible]		[illegible]	[illegible]
Brevet professionnel	[illegible]		[illegible]	[illegible]
Brevet d'enseignement industriel	[illegible]		[illegible]	[illegible]
Brevet d'enseignement commercial	[illegible]		[illegible]	[illegible]
Brevet d'enseignement hôtelier	[illegible]		[illegible]	[illegible]
Diplôme d'élève breveté des lycées techniques d'État	[illegible]		..	[illegible]
Certificat d'études post scolaires agricoles	[illegible]	boys	[illegible]	[illegible]
Certificat d'études post scolaires ménagères agricoles	[illegible]	girls	[illegible]	[illegible]
Secondary Education – technical (II)	Total		[illegible]	[illegible]
Brevet supérieur d'études commerciales	[illegible]		[illegible]	[illegible]
Brevet d'enseignement social	[illegible]		[illegible]	[illegible]
Brevet de technicien	[illegible]		[illegible]	[illegible]
Higher Education (University and Equivalent) :				
[illegible]	[illegible]			[illegible]

	Science	..	[illegible]
	Humanities	..	[illegible]
	Pharmacy	..	[illegible]
— First Degrees and Recognised Equivalents .... Total		..	[illegible]
Licence	Law	..	[illegible]
	Science	..	[illegible]
	Science Teaching	..	[illegible]
	Applied Science	..	[illegible]
	Humanities	..	[illegible]
	Humanities Teaching	..	[illegible]
	Other	..	[illegible]
Diplôme de chirurgien dentiste	Dentistry	..	[illegible]
Diplôme d'État	Pharmacy	..	[illegible]
Diplôme d'Université	Pharmacy	..	[illegible]
Doctorat d'État	Medicine	..	[illegible]
Doctorat d'Université	Medicine	..	[illegible]
Doctorat vétérinaire	Veterinary Med.	..	[illegible]
— Post-Graduate Qualifications .... Total		..	[illegible]
Doctorat d'État	Law	..	[illegible]
	Science	..	[illegible]
	Humanities	..	[illegible]
	Pharmacy	..	[illegible]
Doctorat d'Université	Law	..	[illegible]
	Science	..	[illegible]
	Humanities	..	[illegible]
	Pharmacy	..	[illegible]
Doctorat du 3e cycle	Science	..	[illegible]
	Humanities	..	[illegible]
Titre d'ingénieur-docteur		..	[illegible]
Other Higher Education .... Total		..	[illegible]
Brevet de technicien supérieur		[illegible]	[illegible]
Diplôme de sage-femme	Midwifery	..	[illegible]

1. [illegible]

Source: [illegible]

Reallinje (Natural Science, subdivided to show those taking biology, mathematics and technical studies).

239. When statistics on persons taking the studies/courses are tabulated, they should be broken down to show these options. In the field of higher education, as far as is possible, the same subject breakdown as the classification of students by field of study, should be used. Some of the problems encountered in attempting to do this are discussed in Annex VI. Awards in technical and vocational education should also be broken down by the main field of study.

240. Instead of presenting a blank table, which would not easily illustrate the points that the table should cover, an example has been constructed from published data for a particular country. This example is chosen because it shows all the factors that should appear in a table of this kind: different qualifications that can be obtained at varying levels and types of education, and options or fields of study where these are important. It provides not only successes but numbers entering for an examination as well.

TABLES 11 AND 12

FACTORS INFLUENCING THE RATES OF TRANSITION OF PUPILS

241. Chapters II and III discussed the ways in which individual characteristics and other factors influence a pupil's educational career. In order to make realistic forecasts about likely pupil choices, or for the authorities to influence these choices, it is necessary to know which factors are important, to what measure they explain observed pupil flows and in what way pupils are affected by different policy interventions. The democratisation of education is one example of an educational objective that cannot easily be fulfilled unless some information is available on the factors affecting the participation of different groups in education.

242. The factors influencing educational choices can usefully be divided into two groups: social characteristics and other factors. Some of the most important items in each group are listed below.

Social Characteristics:

— Occupation of Head of Family.
— Education of Parents.
— Family Income.
— Size of family.
— Place of Residence.
— Religious Background.
— Ethnic, Linguistic, National group, etc.

Other Factors:

— Sex.

— Intelligence.
— Previous scholastic performance.
— Facilities provided by the Educational institutions attended (Buildings, Equipment, Teachers, Number of Places, etc.).
— Educational Policy (age limits of compulsory school attendance, minimum entry requirements to universities, aid to students, special programmes for socially underprivileged children, etc.).

265. Individual pupil characteristics can be treated by including them within the basic flow table, in which case it is likely to become very large, with most of the cells filled with zeros, or separate tabulations can be shown for pupils with each characteristic, in which case the number of tables may become rather large. It is useful to distinguish statistics that are necessary for the mechanics of a forecasting model, and those which are necessary in order to improve the predictive or the explanatory value of the coefficients of the model and thus permit its use for planning or decision making. The basic data for the forecasting model are the aggregate flows between each grade and each branch of education. The data on individual characteristics of pupils on the other hand are required to improve the predictive and planning value of the coefficients. In preparing a tabulation programme on pupil characteristics the following considerations may usefully be borne in mind:

i) Where possible all data on pupil stocks and flows should be based on individual record cards of pupils in which the pupil completes a detailed form on entering the system and is given a unique number. All the details on the card should be centrally stored on magnetic tape, and subsequent movements of the pupil within or out of the system recorded.
ii) Where this is not possible for the whole system, information on aggregate flows could be obtained by retrospective questioning. Teachers could report both current and previous year information on their pupils.
iii) In case *ii)* above the aggregate data should be supplemented by special surveys (at regular, but not necessarily annual intervals) to show the experience of pupils with different individual characteristics at the important transition points of the system.
iv) In either case, the printed tabulations should show the aggregate flow tabulations, supplemented by details on individual characteristics of pupils at the important transition points.
v) The more advanced system under *i)* should supplement the printed information with an outline of the additional tabulations that could be made available from the magnetic tapes. This information should be stored on the tapes and made available on request.

266. In different countries the factors that have been mentioned may be of more or less significance. Before difficult and expensive attempts are made to obtain data on any one of these topics, research along the lines suggested in chapter III should be carried out to decide where the greatest effort should be made.

TABLE 11. SOCIO-ECONOMIC BACKGROUND OF NEW ENTRANT

OCCUPATION OF FATHER² (a) ⇒ LEVEL AND TYPE OF EDUCATION ⇓	I PROFESSIONAL, TECHNICAL AND RELATED WORKERS	II ADMINISTRATIVE, EXECUTIVE & MANAGERIAL			III CLERICAL AND SALES WORKERS		
		PUBLIC SERVICE (GOVERNMENT)	OTHERS	TOTAL	WORKING IN PUBLIC SERVICE (GOVERNMENT)	OTHERS	TOTAL
Pre-Primary :							
Pupils							
Primary :							
New entrants							
Pupils							
Graduates							
Secondary :							
General (a) :							
New entrants							
Pupils							
Graduates							
General (b) :							
New entrants							
Pupils							
Graduates							
Technical and vocational (a) :							
New entrants							
Pupils							
Graduates							
Technical and vocational (b) :							
New entrants							
Pupils							
Graduates							
Higher :							
Universities and equivalent degree granting institutions :							
New entrants							
Students							
Graduates³							
Other institutions :							
New entrants							
Students							
Graduates³							
Total — All pupils							

1. By « graduates » is meant all pupils who successfully passed an examination, or obtained a qualification listed in table 16.
2. Or other head of family.
3. Distinguishing between qualifications below level of a first degree, a first degree or equivalent, and post-graduate qualification.

The seven occupational groups shown here correspond to the following Major and Minor Groups of the International Standard Classification of Occupations.

I. Major group 0 : Professional, Technical and Related Workers; Minor Group 0.0 : Deck Officers, Engineer Officers and Pilots of Ships; Minor Group 0.2 : Aircraft Pilots, Navigators and Flight Engineers.

II. Major Group 1 : Administrative, Executive and Managerial Workers. If possible the Minor Group 1.0 should be distinguished : Administrative, Executive and Managerial Workers, Government.

PILS ENROLLED AND GRADUATES[2] AT ALL LEVELS OF EDUCATION

IV RMERS, FISHERMEN, HUN-TERS, LOGGERS, RELATED			V MANUAL WORKERS				VI	VII	
(FARM MANAGERS)	OTHER AGRICULTURAL WORKERS	TOTAL	SKILLED WORKERS	SEMI-SKILLED WORKERS	UNSKILLED WORKERS	TOTAL	SERVICE WORKERS	OTHERS AND NOT SPECI-FIED	TOTAL

III. Major Group 2 : Clerical Workers; Major Group 3 : Sales Workers. If possible this should distinguish Minor Group 3.0 : Working Proprietors in wholesale and retail trade.

IV. Major Group 4 : Farmers, Fishermen, Hunters, Loggers and related workers. Minor Group 4.0 : Working Proprietors, Farmers and Farm managers should be distinguished from farm workers and other persons.

V. Major Group 5 : Miners, Quarrymen and related workers; Major Group 6 : Workers in Transport and Communications Occupations (except Minor Groups 6.0 and 6.2 which are included in I); Major Group 7/8 : Craftsmen, Production Process workers and Labourers not elsewhere classified. Persons in this category should be classified as skilled, semi-skilled or unskilled.

VI. Major Group 9 : Service, Sport and Recreation Workers.

VII. Major Group X : Workers not classifiable by occupation.

TABLE 12. PUPIL PROGRESS BY SOCIO-ECONOMIC BACKGROUND — (EXAMPLE OF COHORT ANALYSIS)

PUPIL PROGRESS → OCCUPATION¹ OF HEAD OF FAMILY ↓	[illegible]	SITUATION OF COHORT IN YEAR t_n												
		PUPILS STILL STUDYING :						PUPILS NO LONGER STUDYING :						
			ENROLLED IN SECONDARY					WHO LEFT IN YEAR t_n						[illegible]
									LEFT FROM SECONDARY					
		[illegible]	(1) [illegible]	(2) [illegible]	(3) [illegible]	(4) [illegible]	[illegible]	[illegible]	(1) [illegible]	(2) [illegible]	(3) [illegible]	(4) [illegible]	[illegible]	
I. Professional, Technical and Related Workers														
II. Administrative, Executive and Managerial Workers														
— Government														
— Other														
III. Clerical and Sales Workers														
— Working Proprietors														
— Other														
IV. Agricultural and Related Workers														
— Farmers, Farm Managers														
— Other														
V. Manual Workers														
— Skilled														
— Semi-skilled														
— Unskilled														
VI. Service Workers														
VII. Others and not specified														
Total														

Notes : a) This table singles out one element only of cohort analysis, for study. A more detailed analysis would show all repeaters, both those who are still in the educational system and those who have left the system and the points at which [illegible] occurred.

b) The cohort of pupils should be followed year by year, and the situation reinvestigated yearly until it can be reasonably expected that all members of the cohort have left the educational system. At this point, a final comprehensive table can be compiled summarizing the educational experience of each socio-economic group comprising the cohort.

c) It is not necessary to follow each year's cohort of new entrants. A new cohort might be followed approximately every five years.

d) It is possible to link information on the progress of two or more cohorts, without waiting for all members to have left the educational system. Such comparisons can provide a useful guide to the likely educational success of members of different socio-economic groups.

Table 11

SOCIO-ECONOMIC BACKGROUND OF NEW ENTRANTS, ENROLLED PUPILS AND GRADUATES IN EACH TYPE OF EDUCATION

265. Variants of this table are often prepared from traditional stock data in order to demonstrate that children coming from different socio-economic backgrounds do not have equal educational opportunity. This table shows new entrants, total enrolment and graduates by level of education and the occupation of father or other head of family. The occupation of father, rather than any of the other social factors has been used in this table, because it seems to be one of the most significant single socio-economic indicators and no purpose is served in laying out sample tabulation schemes for each of the factors enumerated. Multivariate analyses in each country will permit studies of the interaction of all these factors and permit the identification of the most important.

266. This table is a useful departure point for studies of factors influencing student choice but it has one important weakness. Although the table would show the participation of different social groups in absolute terms in different levels and types of education, it does not show the size of the reference group, i.e., although it may be found that of all students in higher education x per cent have fathers who are employed as mineworkers, what is not known is how many children of mineworkers there are of the normal age of higher education. Even if an attempt is made to see how many children of mineworkers there were starting their education 12 or 15 years earlier, the correct reference group would not be known, as all children from different social groups may not progress at the same pace. The best way to relate the results to the same base group is to follow cohorts of pupils with different characteristics. This can be done by distinguishing pupils by their fathers' occupation or other social factors, as they enter compulsory education, and by tracing their progress from that point on all through their educational careers. Assuming that members of each of the socio-economic groups made the same progress and had the same educational opportunity, the weights represented by each social group would remain constant at each stage of education. By finding out what these pupils are doing at regular intervals, and comparing the participation of the social groups in different kinds of education, with their participation in the base period, the likelihood of members of different groups continuing their education up to various ages and levels of education can be assessed, together with the stages at which retardation and dropouts occur.

267. If pupils are categorised by social factors as they enter compulsory education, the information can be used in conjunction with the transition coefficients, to make more realistic forecasts of future participation. This information can also be used to devise measures for encouraging the further participation of relatively under-represented groups. Table 12 is an example of a framework for this type of analysis.

STATISTICS OF TEACHERS

Introduction to Tables 15, 16, 17 and 18

268. One of the main tasks of the educational planner is to estimate the number of teachers required to meet the educational targets set by the plan and the likely supply of new teachers. This is in many ways an even more difficult task than forecasting student enrolments. The future activities of persons having qualifications to teach are dependent on a variety of factors over which the educational policy maker has only partial control.

269. The usual way of calculating the number of persons to be trained as teachers over a plan period is to estimate the total number of teachers in each branch of education during the plan period required to cope with the forecast enrolment assuming, or establishing as targets, certain pupil/teacher ratios. From this total is subtracted the number of teachers in the base date who are expected to be still teaching at the target date. The difference between these two figures is the number of teachers by level and type who should enter the teaching profession between the base and target years.

270. One complication is that it is not possible to assume that all persons teaching now and who have not reached retirement age or died by the target date, will still be teaching at that time. Women teachers often leave the teaching profession temporarily or permanently when they have children. Salaries in occupations other than teaching may make the teaching profession relatively unattractive. Working conditions may be more favourable in other occupations and draw people away from teaching. The latter two factors may be particularly relevant in the case of teachers of specialized technical subjects. This makes the estimation of required inflow into the profession quite complicated. An additional difficulty is that it cannot be taken for granted that the present teacher stock adequately meets current requirements. Apart from general teacher shortages, there may be too many teachers of certain kinds, and too few of others. If the present situation is not carefully studied, current shortages and excesses will be projected into the estimates of future requirements. Furthermore, even if present overall pupil/teacher ratios are satisfactory, it is important to know what proportion of teachers have an educational background suitable for the level and type of education in which they are working.

271. Similar problems are encountered in the estimation of teacher supply. It cannot be assumed that all graduates of teacher training colleges will become teachers; on the other hand, other graduates often become teachers and if salary and working conditions are attractive and recruitment policies appropriate, members of other occupational groups may enter the teaching profession. The following draft tables on teachers have been prepared with these problems in mind.

Table 15

AGE AND EDUCATIONAL BACKGROUND OF TEACHERS, BY TYPE OF INSTITUTION IN WHICH THEY TEACH

272. This table would provide information on two of the factors mentioned in the introductory paragraphs. Information on age permits the estimation of retirements and deaths over the plan period, and in the case of

TABLE 10. AGE AND EDUCATIONAL BACKGROUND OF TEACHERS, BY TYPE OF INSTITUTION¹ IN WHICH THEY TEACH

Educational background → Age ↓	[illegible]		[illegible]	[illegible]	Other educational background	
	[illegible] level	Higher level			[illegible] level	Higher level
Full-time teachers						
Female:						
aged < 25 years						
25-29 "						
30-34 "						
35-39 "						
40-49 "						
50-59 "						
60-64 "						
65 +						
Total						
Male:						
aged < 25 years						
25-29 "						
30-34 "						
35-39 "						
40-49 "						
50-59 "						
60-64 "						
65 +						
Total						
Part-time teachers						
Female:						
aged < 25 years						
25-29 "						
30-34 "						
35-39 "						
40-49 "						
50-59 "						
60-64 "						
65 +						
Total						
Male:						
aged < 25 years						
25-29 "						
30-34 "						
35-39 "						
40-49 "						
50-59 "						
60-64 "						
65 +						
Total						

---

1. A separate tabulation should be made for each type of educational institution using the same categories as table 3. Data on the educational background of teachers in higher education is not necessary in this form.

women teachers in the younger age groups, some indication of the number likely to be leaving the profession to look after their young families. It is also interesting to compare the educational background of the younger teachers with that of the older. This may indicate that younger teachers are better educated or, alternatively, that shortage of teachers is forcing a lowering of standards of qualification of younger teachers.

253. It is sometimes suggested that the age of part-time teachers need not be collected. This is not the case particularly if part-time teachers are numerous and make up a significant contribution of the total teacher force. One of the major educational policies may be to attract young mothers back into the teaching profession on a part-time basis. The age breakdown will indicate the success of such policies.

254. The educational background of teachers is required because one goal of educational policy is to have teachers who themselves are adequately qualified. The educational classification suggested here is very simple, but could be considerably enlarged to show degrees, certificates, diplomas, etc., of teachers by subject of specialization. No mention has been made of « qualified » or « non-qualified » teachers. Each country has its own rules and regulations governing the acceptance of a teacher as « qualified » or not. These rules may vary for level and type of education, age, sex and other characteristics of teachers. For this reason it has not been used in this illustrative tabulation. The actual educational background of a teacher may in many circumstances be considered more relevant for a study of teacher qualifications in a table of this kind, than the particular administrative rules that are applied for certifying a teacher as qualified. This table can be further broken down to show « qualified » and « other » teachers, if this is required for administrative or other reasons.

TABLE 19

ENTRANTS INTO, AND DEPARTURES FROM THE TEACHING PROFESSION BY ORIGIN AND DESTINATION

255. The rate at which people enter and leave the teaching profession is of major importance to educational planners. The starting point for predicting this rate of inflow and outflow should be an analysis of what movements do actually take place from one year to another. As a minimum, data should be available on numbers of new teachers by age and sex, sources of supply of these new teachers, and the number of teachers who leave the profession each year by age and sex. This information should be obtained in detail for teachers in each type of institution.

256. Where possible, statistical information should also be obtained on why teachers are leaving the profession, and what they do when they leave it. The implications for planning are quite different if losses are due to retirement or movement to other employment, or entrance into the inactive population below retirement age. In the first instance, only replacement can fill the gap, whereas in the latter two cases other inducements may keep some teachers in the profession.

257. Statistical information should be collected at least from time to time on :

a) the characteristics of teachers who stay in the teaching profession, as opposed to those who leave ;

Table 16. ENTRANTS INTO, AND DEPARTURES FROM TH

[illegible]	[illegible]		[illegible]	[illegible]		
				[illegible]		
[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]
I. *Full-time Teachers* (teaching in one type of institution only) :						
Pre-primary						
Primary						
Secondary :						
general						
technical						
Higher :						
Universities and equivalent degree-granting institutions						
Other higher institutions						
Other institutions (all types)						
II. *Full-time Teachers* (teaching in more than one type of institution) :						
Pre-primary and primary						
etc.						
III. *Part-time Teachers* (teaching in one type of institution only) :						
Pre-primary						
Primary						
Secondary :						
general						
technical						
Higher :						
Universities and equivalent degree-granting institutions						
Other higher institutions						
Other institutions (all types)						
IV. *Part-time Teachers* (teaching in more than one type of institution) :						
Pre-primary and primary						
etc.						
Total						

ACHING PROFESSION BY ORIGIN AND DESTINATION

b) movements of teachers within the profession between different types of institution. Such movements may have implications for recruitment policies;

c) sources of supply of entrants to the profession. The factors affecting the number of new entrants from each of the main sources;

d) what happens to teachers who leave the profession?

Another type of movement of teachers which must be studied is that from one « category » of teachers to another in the sense of the four categories described below. This can help to avoid double counting in estimates of teacher flows. The four categories are:

i) full-time teachers, who teach in one type of institution only;
ii) full-time teachers, who teach in more than one type of institution;
iii) part-time teachers, who teach in one type of institution only;
iv) part-time teachers, who teach in more than one type of institution.

In the present context, the reference is to type of institution and not to individual institutions. A person teaching in several primary schools teaches in one type of institution. However, for many purposes it is useful to have similar information in terms of each individual institution even if this is not published.

258. Table 19 shows the stock of teachers in two time periods, and the difference in numbers of teachers between these periods, by type of institution and category of teacher (as defined above). The difference is explained by the gains and losses which are recorded for each of the listed groups of teachers.

259. This table would provide answers to the questions raised in (a), (c) and (d) above. Teachers may be considered as belonging to one of three groups:

i) those who were teaching in both t_0 and t_1;
ii) those who were teachers in t_0 and not in t_1 (losses);
iii) those who were teaching in t_1 and not in t_0 (gains).

Table 19 accounts in detail for groups 2 and 3. If information is required on flows of teachers within group 1, a square matrix showing the rows listed in table 19 should be used.

260. This will give a tabulation of the form:

Teachers who taught in both t_0 and t_1 $(t_0 \rightarrow t_1)$

CATEGORY AND TYPE[1] t_1 → CATEGORY AND TYPE[1] t_0 ↓	CATEGORY i	CATEGORY ii	CATEGORY iii	CATEGORY iv
Category i				
Category ii				
Category iii				
Category iv				

[1] For the breakdown of education within each category use the row headings of table 19.

In this way all internal movements, both between types of education and category of teacher could be taken into consideration.

Theme 15

DATA ON TEACHER INPUTS INTO THE EDUCATIONAL PROCESS

201. Teacher statistics traditionally show the total number of persons engaged in teaching activities. They are usually divided into « full-time » and « part-time » teachers. In addition an attempt is often made to distinguish these teachers by the level at which they teach, and the subjects they teach. However, at each stage of this procedure « head-counting » can give a misleading idea of real teacher inputs into the educational process. One reason is that the distinction between a full-time and part-time teacher is not clear-cut and while indicative is not an adequate measure of teacher inputs. The status of « full-time » and « part-time » can vary with age, level of education in which the teacher is employed, sex, qualification, etc. Even standard teaching loads vary considerably. There is also a substantial difference between one part-time teacher who teaches half a day every day, and another who gives one or two lessons a week. Total teaching inputs ought to be measured by considering the number of hours worked in a « typical » week.

202. Another reason for collecting data on the hours of work of teachers is that information is required on the subjects that are taught in each level of education. Many teachers, particularly in secondary schools, teach at more than one level and teach more than one subject. To list teachers by « major » or « principal » subject they teach is not entirely satisfactory.

203. Once meaningful data on teacher inputs (teachers × number of hours taught) are obtained, in order to calculate pupil/teacher ratios using this information, the pupil and his curriculum must be brought into the picture. How many pupils does a teacher have in front of him/her when a class is given ? Simply dividing the number of persons enrolled by the number of teachers gives misleading pupil/teacher ratios. One teacher teaching 30 hours a week may provide the same amount of instruction as six teachers teaching 5 hours a week. A pupil/teacher ratio using absolute numbers of teachers as the denominator could be quite far off the mark if numbers of both pupils and teachers are not weighted by the number of hours of instruction received and given.

204. One of the problems that most concerns educational planners in nearly all countries is that of shortage of teachers. This is a problem that needs to be studied in some detail in any educational planning that is at all sophisticated. An overall pupil/teacher ratio that is satisfactory may conceal shortages or surpluses in particular subjects. What is really required is a pupil/teacher ratio weighted by the number of hours devoted by pupils and teachers to each major subject of the curriculum. Any subject requiring specialist teachers must be individually considered. Shortages may be effected by the use of persons not having what are normally considered adequate qualifications, by a higher pupil/teacher ratio and a higher rate of overtime working in those subjects where there are not enough teachers.

205. For the reasons enumerated above it is suggested that the following data should be collected on teacher inputs :

Illustrative Questionnaire

ALLOCATION OF TIME OF PUPILS AND TEACHERS BETWEEN DIFFERENT SUBJECTS IN PRIMARY AND SECONDARY EDUCATION

1. Number of hours given (to be filled out by each teacher covered by survey)
2. Number of hours received (to be filled out for each pupil covered by survey)

NO. OF HOURS PER WEEK → SUBJECT ↓	1	2	3	4	5	6	7	8	9	10	11	..	..	..	..	..	..	..	..	..	..	..	..	40	..	..	..	..	TOTAL
Language :																													
National Language																													
Foreign Languages																													
(English)																													
(French)																													
(German)																													
(Greek)																													
(Latin)																													
etc.																													
Mathematics-Science :																													
Algebra																													
Geometry																													
Arithmetic, etc.																													
Biology, Zoology																													
Physics																													
Chemistry, etc.																													
Other Subjects :																													
Geography																													
History																													
Civics																													
Social Studies																													
Music																													
Art																													
Religious Education																													
Needlework																													
Physical Education																													

etc.																													
Free-time																													
Total																													

1. This information should be collected for persons teaching in each type of primary and secondary institution for which data in table 2 (Institutions) are collected.

This is not meant to be a rigid scheme for tabulation. It is given as an indication of how problems of teacher hours can be studied.

The data could be obtained through administrative channels for teachers and from regular curricula set out for pupils.

a) Total number of teachers in each type of institution.

b) The number of hours devoted to each subject by each teacher in a « typical » week[1] during the school year.

c) Total number of pupils by type of institution in which they are enrolled.

d) The weekly programme (curriculum) followed by each pupil during the same « typical » week during the school year.

266. These data will provide the information that is needed to study the factors mentioned in the preceding paragraphs, to avoid double-counting of teachers and to calculate weighted pupil/teacher ratios.

TABLE 15*a*. WEEKLY HOURS TAUGHT AND INSTRUCTION RECEIVED, BY SUBJECT

For each subject, compile from individual questionnaires

1. National Language
2. Foreign Languages

etc...

NUMBER OF HOURS (×) TAUGHT OR STUDIED WEEKLY	NUMBER OF TEACHERS TEACHING (×) HOURS	NUMBER OF PUPILS STUDYING (×) HOURS	TOTAL NUMBER OF HOURS TAUGHT	TOTAL NUMBER OF HOURS STUDIED
(×) = 1 Hrs				
» 2 »				
» 3 »				
» 4 »				
» 5 »				
» 6 »				
» 7 »				
» 8 »				
» 9 »				
» 10 »				
» 11 »				
» 12 »				
» 13 »				
» 14 »				
» 15 »				
» 16 »				
» 17 »				
» 18 »				
» 19 »				
» 20 »				
» 21 »				
» 22 »				
» 23 »				
» 24 »				
» 25 »				
» 26 »				
» 27 »				
» 28 »				
» 29 »				
» 30 etc.				
Total				

This should be compiled for each of the types of institutions distinguished separately.

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[1] A week is used to describe the analysis, but any time period could be chosen.

TABLE 15*b*. SUMMARY TABLE OF HOURS OF INSTRUCTION GIVEN AND RECEIVED

SUBJECT	NUMBER OF PERSONS TEACHING SUBJECT	TOTAL NUMBER OF HOURS SUBJECT IS TAUGHT	TOTAL NUMBER OF PUPILS STUDYING SUBJECT	TOTAL NUMBER OF HOURS SUBJECT IS STUDIED
Languages :	(Duplicate)[1]		(Duplicate)[1]	
i) National Language				
ii) Foreign Languages :				
e.g. (English)				
(French)				
(German)				
(Greek)				
(Latin)				
etc.				
Mathematics-Science :				
Algebra				
Geometry				
Arithmetic, etc.				
Biology, Zoology				
Physics				
Chemistry, etc.				
Other Subjects :				
Geography				
History				
Civics				
Social Studies				
Music				
Art				
Religious Education				
Needlework				
Physical Education				
Technical Subjects :				
(Woodwork)				
(Metalwork)				
etc.				
Total	(unduplicated)[2]		(unduplicated)[2]	

---

[1] As teachers often teach more than one subject, they will be listed more than once. The same applies to pupils.

[2] Shows total number of teachers or pupils unduplicated.

267. Although an I.D. system for teachers would simplify the data collection and processing considerably, special sample surveys could be used. During a « typical » week of the school year, a representative sample of primary and secondary institutions, chosen according the school location, number of enrolled pupils, type of institution, etc., could be surveyed. Each teacher covered by the sample should complete a simple questionnaire showing the number of hours taught during the week in which the survey is carried out, and the subjects taught during those hours. Under teacher supervision, each pupil should do the same. When this procedure has been completed, information for each kind of primary and secondary institution will be available to obtain :

i) frequency distribution per subject of the number of hours of instruction given by each person teaching the subject ;
ii) frequency distribution per subject of the number of hours of instruction received by each person studying the subject ;
iii) frequency distribution of the number of hours taught by all teachers ;
iv) total hours taught for each subject ;
v) total hours instruction received for each subject.

268. An illustrative questionnaire is shown, which, if filled out by all teachers and pupils covered by the survey, would provide the data required to carry out the analysis just described. Tables 15a and 15b show typical tabulations that can be drawn up when the data are compiled. In this questionnaire it is suggested that data be collected for teachers and for pupils. As it may not be easy to get pupils to fill out a questionnaire of this nature adequately, the most satisfactory method of seeing that data cover the *same* pupils and teachers, would be for teachers to identify for each lesson period and subject, the number of pupils who were present[1]. In the first instance, data for pupils could de estimated from fixed curricula.

269. The proposals for data collection are presented in aggregated form, but it would be useful for them to be disaggregated to take into account qualifications, sex and age of teachers, and grade and sex of pupils.

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[1] In the autumn of 1965, a curriculum survey and survey of deployment of teachers in England and Wales was carried out. In sampled schools, each pupil was identified by a number, e.g. numbers 001-600 in a school enrolling 600 pupils. Each teacher in the school then completed an individual questionnaire which gave :

Name, Age, Academic Qualification
Weekly time-table showing which pupils were being taught which subjects :

E.g.	*Subject*	*Pupil Nos.*	*Hrs. & Mins in Wk*
	English	59 - 89	9.20
	History	59 - 89	2.45
	English	234 - 269	3.45
	Non-teaching time		2.20
		TOTAL HRS.	18.10

With this information, pupil time tables can be derived, as every time a particular pupil follows a course, some teacher will have him listed as having been taught. In this case it is not necessary for pupils to fill out questionnaires themselves, or have school authorities do it for them. This places an extra burden on the teachers being surveyed, but the gain in accuracy and usefulness of data probably warrants this.

NOTE. Because this scheme may seem rather complicated at first sight, a small example has been *constructed* to show the operation of these tables. This example is highly simplified, and in reality these data could hardly be processed without the aid of an electronic computer.

Example :

270. A school has 12 teachers and 100 pupils. For simplicity, it is assumed that there are four (4) classes, four subjects of study and a 30-hour curriculum for pupils in all classes. It is further assumed that pupils in grades 1-3 follow a uniform programme, but that pupils in grade 4 have four options open to them.

Summary :

1 institution
4 classes, grades
100 pupils
30 hours per week, all pupils
4 subjects of study (mathematics, science, languages, other subjects)
grades 1-3, uniform programmes of study ;
grade 4, 4 options open to pupils ;
12 teachers.

Enrolment by Grade

Grade 1 has 25 pupils
Grade 2 has 30 pupils
Grade 3 has 25 pupils
Grade 4 has 20 pupils (3, 4, 7 and 6 in options 1 to 4 respectively)
Total ..... 100 pupils

271. The standard programmes for grades 1, 2 and 3 and optional programmes for grade 4, are :

GRADE ENROLMENT → SUBJECTS ↓	GRADE 1 (25 PUPILS)	GRADE 2 (30 PUPILS)	GRADE 3 (25 PUPILS)	GRADE 4			
				OPTION 1 (3 PUPILS)	OPTION 2 (4 PUPILS)	OPTION 3 (7 PUPILS)	OPTION 4 (6 PUPILS)
Languages	10 hrs	10 hrs	8 hrs	15 hrs	2 hrs	8 hrs	8 hrs
Mathematics	5 hrs	6 hrs	6 hrs	—	13 hrs	7 hrs	10 hrs
Science	3 hrs	5 hrs	6 hrs	—	10 hrs	8 hrs	5 hrs
Other Subjects	12 hrs	9 hrs	10 hrs	15 hrs	5 hrs	7 hrs	7 hrs

272. The twelve teachers in the school teach the following subjects for the following number of hours :

SUBJECTS TAUGHT → NUMBER OF HOURS ↓	NO. OF TEACHERS TEACHING (x) HOURS	HOURS DEVOTED TO GIVEN SUBJECT			
		MATHEMATICS	SCIENCE	LANGUAGES	OTHER SUBJECTS
(x) = 1	—	—	—	—	—
» 2	1	—	2	—	—
» 3	1	—	3	—	—
» 4	2	—	—	4	4
» 5	1	5	—	—	—
» 6	—	—	—	—	—
» 7	—	—	—	—	—
» 8	—	—	—	—	—
» 9	1	—	—	9	—
» 10	1	—	—	—	10
» 11	—	—	—	—	—
» 12	—	—	—	—	—
» 13	—	—	—	—	—
» 14	1	—	—	—	14
» 15	—	—	—	—	—
» 16	—	—	—	—	—
» 17	—	—	—	—	—
» 18	1	—	—	18	—
» 19	—	—	—	—	—
» 20	1	10	10	—	—
» 21	—	—	—	—	—
» 22	—	—	—	—	—
» 23	1	—	—	10	13
» 24	1	15	9	—	—
» over	—	—	—	—	—
Total	12	30	24	41	41

273. With the information on pupils and teachers outlined above, we can produce the table presented on page 137.

274. From the above table, which is the equivalent of table 15b, the following information can be obtained :

i) Number of pupils studying different subjects. (Here 97 out of 100 pupils study mathematics, 100/100 languages, etc.)

ii) Total hours, and therefore average number of hours devoted to these subjects of study.

iii) Number of teachers teaching different subjects. (Here only 3 teachers teach more than one subject.)

iv) Total number of hours devoted to the teaching of each subject.

v) Item *ii*) divided by item *iv*) gives pupil/teacher ratios per subject, which can be compared with each other, and overall pupil/teacher ratio.

275. If pupil/teacher ratio were calculated on an unweighted basis, it would be 100/12 = 8.3.

276. Dividing total number of hours studied by total number of hours taught, it is 3000/136 = 22. This shows the average number of pupils who actually face a teacher in any teaching period. Similar pupil/teacher ratios can be calculated for each subject specialisation.

EXAMPLE TO SHOW HOURS OF INSTRUCTION GIVEN AND RECEIVED

(x) — HOURS	MATHEMATICS				LANGUAGES				SCIENCE				OTHERS				ALL SUBJECTS	
	PUPILS STUDYING (x) HRS	TOTAL HOURS STUDY	TEACHERS TEACHING (x) HRS	TOTAL HOURS TAUGHT	PUPILS STUDYING (x) HRS	TOTAL HOURS STUDY	TEACHERS TEACHING (x) HRS	TOTAL HOURS TAUGHT	PUPILS STUDYING (x) HRS	TOTAL HOURS STUDY	TEACHERS TEACHING (x) HRS	TOTAL HOURS TAUGHT	PUPILS STUDYING (x) HRS	TOTAL HOURS STUDY	TEACHERS TEACHING (x) HRS	TOTAL HOURS TAUGHT	TOTAL HOURS STUDY	TOTAL HOURS TAUGHT
a	*b*	*a*×*b*	*c*	*a*×*c*	*d*	*a*×*d*	*e*	*a*×*e*	*f*	*a*×*f*	*g*	*a*×*g*	*h*	*a*×*h*	*i*	*a*×*i*		
(x) — 1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
„ 2	—	—	—	—	4	8	—	—	—	—	1	2	—	—	—	—	8	2
„ 3	—	—	—	—	—	—	—	—	25	75	1	3	—	—	—	—	75	3
„ 4	—	—	—	—	—	—	1	4	—	—	—	—	—	—	1	4	—	8
„ 5	25	125	1	5	—	—	—	—	36	180	—	—	4	20	—	—	325	5
„ 6	55	330	—	—	—	—	—	—	25	150	—	—	—	—	—	—	480	—
„ 7	7	49	—	—	—	—	—	—	—	—	—	—	13	91	—	—	140	—
„ 8	—	—	—	—	38	304	—	—	7	56	—	—	—	—	—	—	360	—
„ 9	—	—	—	—	—	—	1	9	—	—	1	9	30	270	—	—	270	18
„ 10	6	60	1	10	55	550	1	10	4	40	1	10	25	250	1	10	900	40
„ 11	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
„ 12	—	—	—	—	—	—	—	—	—	—	—	—	25	300	—	—	300	—
„ 13	4	52	—	—	—	—	—	—	—	—	—	—	—	—	1	13	52	13
„ 14	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	14	—	14
„ 15	—	—	1	15	3	45	—	—	—	—	—	—	3	45	—	—	90	15
„ 16	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
„ 17	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
„ 18	—	—	—	—	—	—	1	18	—	—	—	—	—	—	—	—	—	18
„ 19	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
„ 20	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
„ 21	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
„ 22	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
„ 23	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
„ 24	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
„ 25	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	97	616	3	30	100	907	4	41	97	501	4	24	100	976	4	41	3000	136

Tables 16*a* and 16*b*

TEACHERS IN HIGHER EDUCATION

277. More than in other branches of education, aggregate staff/student ratios in higher education give an incomplete picture of the amount of instruction received by students. There are two principal reasons. First, university staff members devote much higher proportions of their working time to non-teaching activities than teachers in other branches of education; second, the size of the group of students taught is usually very flexible, ranging from lectures attended by several hundred students at a time, to individual tuition of students. In addition, both students and teachers in higher education are much more specialised than in other branches of education so that any analysis of staffing requirements must be carried out in terms of each faculty or departmental specialisation. Another complication is that staff status is possibly more important in higher education than in other branches. Any analysis of the staffing situation in higher education, and hence any estimate or forecast of staff needs must therefore take into account in addition to the total number of teachers :

a) the faculty or department in which they teach ;
b) their status in the academic hierarchy ;
c) how they allocate their time between teaching, research and other activities ;
d) how they allocate their teaching time between lectures (to a relatively large number of students) and smaller seminars, discussion groups or practicals.

278. Tables 16 and 17 are intended to throw light on these issues, and would provide the starting point of an analysis of staffing needs in higher education[1].

279. *Table 16a* would show the total number of staff of institutions of higher education by status and by specialisation. It is the basic table for any analysis of staffing needs. The table should be compiled separately for each of the main types of institution of higher education[2]. The table can also be extended to show part-time and full-time staff separately. It may also be thought desirable to use a more detailed breakdown of subject specialisation.

280. *Table 16b* shows the allocation of time of university staffs. This is clearly rather difficult information to obtain and interpret, but its potential importance warrants the effort. The difficulties of persuading university staffs to complete a rather detailed questionnaire need not be discussed in the present context. It may, however, be remarked that the response rate to a much more detailed voluntary postal survey of university teachers undertaken by the Robbins Committee was 86 %[3]. Higher rates of reporting

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[1] A detailed analysis would require many more data ; see, for example, *Teachers in Higher Education*, Appendix Three of the *Robbins Report* (*op. cit.*). The present tabulations, as all the tabulations in this chapter, are illustrative of those which might be produced in any publication of educational statistics that was oriented towards educational planning.

[2] In some cases it may be thought necessary to provide the information separately for each institution.

[3] Only 10 per cent could definitely be considered as non-respondents *Teachers in Higher Education* (*op. cit.*). Annex W paragraph 12.

might be expected from a regular and less detailed questionnaire. A more substantial problem is that university staffs have different allocations of their time in term-time and vacations. Since in most countries nearly all teaching is done during term-time, it would be possible, from the point of view of teaching only, to restrict the information to term-time activities ; however, the information is also likely to be useful in statistical analyses of research efforts and it is therefore worthwhile to attempt to include vacation activities as well. For some purposes, it may be felt that the global distribution of time is not a sufficiently refined measure and that measures of dispersion may also be necessary, to show how many university teachers might reasonably be expected to devote more time to teaching, etc. Such information is not proposed here since any full analysis of the matter is extremely complex and is not easily susceptible to presentation in routine statistical tabulations.

281. Such data are likely to be collected by means of questionnaires to staffs of institutions of higher education. The type of questionnaire that might be used is shown below. This questionnaire was used by the Robbins Committee and applies to specific United Kingdom conditions. Other countries would need to design a questionnaire relevant to their own organisation and structure of higher education.

282. « After considering the categories set out in this question, and their definitions in Appendix A, please state :

IN THE FORTNIGHT FROM 18TH FEBRUARY TO 3RD MARCH, THE NUMBER OF HOURS YOU HAVE SPENT APPROXIMATELY ON THE FOLLOWING TYPES OF WORK ?

A. Teaching — see Appendix A.

	UNDER-GRADUATE	POST-GRADUATE	UNDER-GRADUATE AND POST GRADUATE
a) Lectures			
b) Discussion periods			
c) Written exercise classes................			
d) Practicals			
e) Field periods			
f) Preparation for (*a*) to (*e*) (see Note below)			
g) Correcting written work other than examination questions or written work disposed of in the presence of students			

Note : under A (f) long-term preparation for future teaching, such as reading or research that may fructify in a future course of lectures, should not be included.

	Hours
B. Other Teaching	
a) EXTRA MURAL	
b) OTHER (i.e. non-University)	
C. Advice to and consultation with students in an official capacity on personal problems	
D. Meetings of learned societies and conferences, including those organised on a faculty or departmental basis (please include all such meetings whether or not students were present, provided they did not form part of a course of regular instruction)	
E. Examining (including setting, invigilating, oral, marking, etc.)	
F. Research (e.g. work undertaken mainly with the possibility of publication in mind)	
G. Other private study connected with your work	
H. Administration of University/College/Departmental affairs, including Committees, interviews, official correspondence ...	
Other professional work :	
i) outside the University	
a) acting as a consultant	
b) external Committees or administration	
c) Other	
ii) within the University	

⁂

Appendix A

1. *Lecture* means a teaching period occupied wholly or mainly with *continuous exposition by the lecturer*. Students attending it may be given some opportunity for questions or a little discussion, but in the main they have nothing to do except listen and take notes. A teaching period which complies with both the definition of a lecture and with that of a field period (see below) should be recorded as a field period.

2. *Discussion period*. This differs from a lecture in requiring much more participation from the student ; e.g. there may be reading and study of a paper by a student ; discussion, in which students are meant to take part, of topics introduced by a member of staff or a student ; a member of staff may go through essays or questions prepared by student(s) ; there may be discussion of *any* academic matters or problems on the initiative of students or staff.

Questions will be found relating to *tutorials* and *seminars*.

By *tutorial* is meant a discussion period at which not more than four students are present *and* which is one of a series of such periods, extending for at least a term, in which each period is to be conducted (barring illness or other unavoidable cause) by the same teacher.

By *seminar* is meant a discussion period which is not a tutorial.

A discussion period which complies with the definition of a field period (see below) should be recorded as a field period.

3. *Class*. At a discussion period the participation of the student is, in the main, participation in a *discussion*. At a class the student's main activity is doing an exercise of some kind. In a *written-exercise class* the exercises such as mathematical exercises or translations from one language to another, do not, except incidentally, involve the

handling of apparatus instruments or specimens; in a *practical class* the exercises do involve such handling, e.g. scientific experiments; dissection of specimens; learning the use of calculating machines; drawings, plans, diagrams or maps of precision. (A free-hand sketch in a written exercise would not turn a written-exercise class into a practical class. Mathematical exercises in which slide rules or calculating machines are used should be classed as written exercises).

A class which complies with the definition of field period (see below) should be recorded as a field period.

4. *Field period* is a teaching period for the study of material which cannot be brought into premises normally used for teaching (e.g. live plants or animals, rock formations; antiquities, works of art). Consequently the period has to be held out of doors or in premises (e.g. farm buildings; hothouses; Courts of Law; public museums) which would not normally be used as a teaching place. Include as time spent on a field period time taken in travel to its location.

5. An *extra-curricula lecture* is one which is outside the normal teaching programme of your department and is primarily, though not exclusively, intended for students of other departments and/or for the general public.

Source of above questionnaire and definitions, *HIGHER EDUCATION* (Appendix Three to the Report of the Committee appointed by the Prime Minister under the Chairmanship of Lord Robbins 1961-63. HMSO, London). »

Table 16a. STAFF OF INSTITUTIONS OF HIGHER EDUCATION[1], BY STATUS AND FIELD OF SPECIALISATION

STATUS OF STAFF[2] →	ACADEMIC STAFF						NON-ACADEMIC STAFF[4]
	SENIOR LEVEL		MIDDLE LEVEL		JUNIOR LEVEL		
FIELD OF SPECIALISATION ↓	TOTAL	NO TEACHING	TOTAL	NO TEACHING	TOTAL	NO TEACHING	
Pure Sciences							
Architecture							
Technology...........							
Medical Sciences......							
Agriculture							
Humanities							
Fine Arts							
Education							
Law							
Social Sciences							
Other Fields							
Not classifiable by field of specialisation[3]							
Total							

1. Separate tabulations may be provided for each type of institution of higher education, and disaggregated to show age and sex.
2. Where relevant, full-time and part-time staff should be shown separately.
3. Persons not attached to a particular faculty, department or field of specialisation.
4. If possible, persons holding non-academic posts should be classified as clerical workers, laboratory assistants, etc.

TABLE 16b. WORK OF ACADEMIC STAFF OF INSTITUTIONS[1] OF HIGHER EDUCATION WEEKLY HOURS DEVOTED TO EACH MAJOR ACTIVITY IN TERM-TIME[2]

ACTIVITY → STATUS AND SPECIFICATION ↓	WORK IN INSTITUTION OF HIGHER EDUCATION							WORK OUTSIDE THE INSTITUTION	TOTAL HOURS WORKED
	TEACHING				RESEARCH	ADMINISTRATION	OTHER WORK		
	LECTURES	SEMINARS DISCUSSIONS	PRACTICALS	OTHER TEACHING					
Pure Sciences :									
a) Senior Staff									
b) Middle-Level Staff									
c) Junior Staff									
Architecture :									
a) Senior Staff									
b) Middle-Level Staff									
c) Junior Staff									
Technology :									
a) Senior Staff									
b) Middle-Level Staff									
c) Junior Staff									
Medical Sciences :									
a) Senior Staff									
b) Middle-Level Staff									
c) Junior Staff									
Agriculture :									
a) Senior Staff									
b) Middle-Level Staff									
c) Junior Staff									
Humanities :									
a) Senior Staff									
b) Middle-Level Staff									

b) Middle-Level Staff									
c) Junior Staff									
***Education* :**									
a) Senior Staff									
b) Middle-Level Staff									
c) Junior Staff									
***Law* :**									
a) Senior Staff									
b) Middle-Level Staff									
c) Junior Staff									
***Social Sciences* :**									
a) Senior Staff									
b) Middle-Level Staff									
c) Junior Staff									
Other Fields									
a) Senior Staff									
b) Middle-Level Staff									
c) Junior Staff									
***Staff not classifiable by specialisation* :**									
a) Senior									
b) Middle-Level									
c) Junior									
All Academic Staff									

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1. Each type of institution may be shown separately.
2. For some purposes, separate tabulations could be made for activities during vacations.

Table 17

THE EDUCATIONAL STOCK OF THE POPULATION

283. The growing realisation that the education of the working population is in some way connected with economic output and productivity has resulted in many attempts at analysing this relationship. The awareness of the importance for the economy of the skill-mix of the working population has also resulted in the development of long-term educational planning to provide the basis for meeting future needs in skill and training of the labour force. The social and cultural advantages of a highly educated population are not in any way under-rated by educational planners who use manpower forecasts, but from the viewpoint of both the individual and society, education does have important occupational and economic implications. As well as preparing many people for specific occupations, it affects the ability of the working population to operate efficiently, and to adjust to rapid technological change. Attempts must be made to obtain data on this topic as part of any programme for the development of educational statistics.

284. The « educational stock » does not have to be measured at frequent intervals, as it does not change very rapidly. Most persons entering the labour force remain in it for over forty years. The net annual change in the number of people who have completed their education will thus account for only a small proportion of the total stock. What this means is that in the short run, the current output of the educational system cannot greatly influence the educational stock. In order to measure changes from one period to another a relatively long time interval is sufficient. The population census or surveys associated with it seem to be the ideal source for aggregate information on the stock and deployment of educated manpower because of the complete coverage of the population and because a time interval of ten years is not excessive in this area. Once the global picture has been drawn by the census, sample surveys and other special studies can be used to elucidate particular problems and the results can be generalised to cover the whole population[1]. The rest of this text will be based on the assumption that the decennial census (with possible intercensal checks) will be the main source of information for this material in the foreseeable future, as it has been in the past[2].

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[1] For example, the United States Postcensal Survey of Professional and Technical Manpower based on a sample of 70,000 persons drawn from 1960 census returns. Several reports based on this survey have been prepared. e.g.

a) Employment conditions of Scientific and Technical Personnel, 1960 and 1962.
b) Education and Training of Scientific and Technical Personnel.
c) Characteristics of the United States College-Trained Population.

These reports are being published by the National Science Foundation. For details of this survey, see Annex VI.

[2] There are in fact other ways in which the information could be collected in the more distant future, making better use of modern statistical techniques and processing methods. Two of the most important are :

a) « Micro-censuses, » or frequent sample surveys, each one dealing in detail with particular characteristics of the population.
b) Individualised record cards. This technique which is now being developed in the field of educational statistics could be extended to cover the whole population.

The census would then provide an overall check on the detailed information obtained from these more sophisticated methods.

In order to evaluate the educational characteristics of the population, questions may be asked on one of the following topics :

a) Number of years of full-time or formal education completed (sometimes including full-time equivalent of part-time study) (Educational attainment).
b) Highest level, or cycle within the level (primary, secondary, higher) or highest grade completed.
c) Qualifications obtained.
d) Age at which full-time formal education ceased.

285. These questions in themselves reveal little about field of specialisation. Since this is rather important for work involving the occupational structure of the labour force, and the planning of education, supplementary questions dealing with these topics need to be asked. For example, coupled with a question on qualifications obtained, a question on the field of study can be asked.

286. The advantages and disadvantages of each of these approaches to measuring educational attainment need some consideration.

A. NUMBER OF YEARS[1] OF FULL-TIME OR FORMAL EDUCATION COMPLETED

287. This measure has the advantage of being purely quantitative. It avoids most of the problems of making qualitative statements based on value judgements. It is likely that most people remember how many years they spent in school, so that reasonably accurate responses could be excepted to a census question of this type.

288. The measure has, however, certain inadequacies, and several drawbacks if not used in conjunction with some other measures.

289. The number of years of education received can be very misleading if the grade in which pupils finished their education is not known. In countries having many years of compulsory education, some pupils may spend several of those years repeating grades. Though they may have eight years of formal education to their credit, they may in fact have only reached a grade far below the 8th. The reverse would of course apply to pupils who pass through the system more rapidly than the average. To give an idea of the size of this problem, the results of the 1960 United States Census of Population show that at the age of 12, 11 per cent were « retarded » in 1960 and 22 per cent in 1950[2]. Clearly a measure of number of years of schooling completed only would contain quite a large error of over-statement of educational achievement.

290. To summarise, the number of years of schooling completed, by itself, is inadequate. If used, it often needs to be supplemented with data on highest grade completed, or qualification obtained. It is necessary to know how far along the educational « ladder » the number of years of schooling brought each member of the adult population, and not just how long they were climbing.

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[1] Number of years are not to be equated with number of grades.

[2] 1960 Census of Population. Volume I. Characteristics of the Population, Part I, United States Summary. (U.S. Bureau of the Census.)

B. Classification by Highest Level, or Cycle Within Level or Highest Grade Completed

291. This method is the one recommended by UNESCO and was later incorporated into the recommendations of the Conference of European Statisticians for the 1960 round of population censuses.

292. The highest grade completed is a better measure, in many ways, than the number of years completed, because it allows for acceleration and retardation through the educational system.

293. A great number of children leave the educational system when they reach the age at which compulsory schooling ends. The « level » this happens to be, depends not only on the compulsory education laws but also on the age at which a country decides that « primary » schooling has ceased, and « secondary » schooling commenced. In the majority of the European countries, compulsory education laws cover the whole of the primary cycle (as defined in each country), and some grades of the secondary cycle. No European country yet makes the whole secondary cycle compulsory (if the completion of this cycle is considered as being the point at which a pupil satisfies the minimum entry requirements to an institution of higher education). If the only categories used for classification are « completed primary », « completed secondary », etc., the tabulated statistics will understate quite considerably the amount of education received by a majority of the population. A large number of pupils complete several grades of the secondary level, without having completed the whole level. The only way allowance could be made for this would be to tabulate all persons having completed a certain number of grades at the different levels, within the categories by level. Thus instead of simply completed primary, completed secondary, etc., tabulations made in this way would also show the number of persons having completed one grade, two grades, etc., of education within the level.

C. Qualifications Obtained

294. The award of a degree, diploma, certificate, etc. is in nearly all countries the most usual way of marking the successful completion of a course of study. If it is educational achievement in the strictest sense of the word that is to be measured, then only persons who have obtained the qualification at the end of a particular course of study can be considered as having « achieved » that level or type of education.

295. For higher education, in particular, there are good grounds for adopting this view. It is the qualification that is required in order to practise certain professions; it is often the possession of a degree that helps employers to judge the suitability of persons for certain types of employment. There is little doubt that for most higher level jobs, judgement by employers is heavily influenced by the level and type of qualifications of different candidates. For studies on the deployment and utilisation of qualified manpower, and for educational planning, it is important therefore, to know the relationship between level and type of qualification possessed, and occupation held in the labour force.

296. This method of ascertaining educational characteristics does not present many difficulties from the point of view of collection of data. It is not difficult to formulate an easily comprehensible and precise question on qualifications possessed by all persons above a certain age. It is much easier to remember qualifications possessed than the age or year in which full-time or formal education ceased. This problem can be appreciated if one stops to consider how many persons there are who have terminated their education 20, 30, 40 or more years ago. It is not so clear, however, that the processing of data on qualifications can be done easily. In some countries the number of qualifications is very large (several hundred in France, for example) and therefore the transfer of information from census returns to data cards for processing and tabulation may present some problems. Difficulties are also to be expected as a result of individuals reporting more than one qualification at the same level.

297. Apart from the technicalities of using qualifications as a measure of educational attainment, there are also some conceptual issues to be faced particularly if such data are to be used for international comparisons as they very frequently are.

298. Not all countries have a primary school leaving certificate, and in others the award of the secondary school leaving certificate is not dependent on an official national or regional examination. If there is no qualification below the completion of secondary education, the education of the mass of the population will hardly be known at all. The only piece of information will be that a given percentage of persons do not possess any qualifications below the level of completed secondary. Since there are wide variations in the education of this group, it is desirable to have information on grades completed to supplement any questions on the qualifications of persons.

299. Many studies of the contribution of education to economic development have paid a great deal of attention to persons in scientific, technical and professional occupations, and their educational qualifications. As long as the main interest is directed towards academic and higher qualifications, this method of measuring educational attainment is probably the best. So many students obtain their qualifications by unconventional means (signifying here any other way than full-time attendance for a prescribed time period at a recognised institution) that measures such as number of years, age of termination of studies, etc., are not very meaningful. For persons attending evening classes, for part-time students, for persons interrupting their studies for military service, etc., the relevant question is, whether or not they successfully completed the course of study. The reason this problem does not arise to a significant extent with a primary and secondary education is that, at least during the period of compulsory school attendance in OECD countries, there is very little irregular attendance, and pursuit of studies in the informal ways described above, as is the case for higher education. In countries where there is a great deal of professional and technical education at the secondary level (for exemple in Germany), after the minimum school leaving level, questions on professional and technical qualifications at this level also may need to be asked.

300. As was shown in the previous section, a tabulation simply of the highest level, or in the present case qualification, attained will tend to under-

state the educational attainment of a large number of persons who have some years of primary, secondary or higher education, without having completed the level or obtained a qualification at the end of the course. For this reason, it is important that if for higher education a tabulation by years of study completed is not possible, at least those who have started a course of higher education without completing it should be separately enumerated. For the primary and secondary levels as suggested above, tabulations by single grades completed should be made.

301. For many purposes it is important to know the type of qualifications or the specialisation of the qualification. The implications for the economy are likely to be very different, between for example, a large number of lawyers, and a small number of engineers, and the reverse situation with many engineers and relatively few lawyers. In addition, it is important for the educational planner to know if people are entering occupations for which their educational qualifications would appear to fit them. The degree of detail possible is almost unlimited, but it is recommended that the following should be the main groupings : Natural Sciences, Architecture, Engineering and Allied Subjects, Medicine, Agriculture, Humanities, Fine Arts, Education, Law, Social Sciences and other subjects[1]. Qualifications obtained through non-academic channels, such as through a recognised professional association should be included, if they are considered and accepted as an alternative to formal academic training. Thus membership of a professional institution in the United Kingdom should be considered as a qualification of higher education, even if the possessor has not attended a university or other higher institution. The standards required for membership are the criterion, and each country must decide which non-academic channels are of a sufficiently high standard to be included in tabulations of the educational stock.

302. In conclusion, it may be said that questions on qualifications are most relevant with respect to higher education. In some countries they may also be important for technical education.

D. Age at which Full-time or Formal Education Ceased

303. This criterion cannot strictly be considered an indicator of educational attainment. It is rather a social indicator ; it gives information about the implementation of compulsory education laws or about the tendency to stay on or drop out at certain ages. It is legitimate to suggest that these questions can best be investigated with the help of time series of enrolment and graduation statistics, rather than censuses of the adult population. Those who seek such information should turn to the educational statistician rather than the census authorities. Retardation, acceleration, interruptions in education, moreover, make the interpretation of data given in this form extremely hazardous, particularly for those people who have education beyond the compulsory level. If this question is asked it should be used only in conjunction with other questions on grade or qualification. It is true that it is a simple question, easily understood and thus has appeal to designers of census questionnaires. However, if the data collected do not supply the information required, it is nevertheless a lost question.

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[1] This accords closely with the recommandations of UNESCO, but can be further broken down to suit national educational systems.

Note : *Informal Education.* A great deal of on-the-job training is given in firms. It is often rather difficult to distinguish this from experience gained on the job, but often it is quite clear cut to make the distinction. For certain types of skilled jobs, the technical training required may be provided entirely by the firm. It is rather difficult to attach any gradation by level to this kind of training, though it is of great importance in determining the operating efficiency of certain sections of the labour force. This kind of training may never be recognised by the award of a diploma or the passing of an examination. Thus none of the conventional criteria for measuring educational attainment are possible. Nevertheless, it is important to know how many members of the population have had this type of education. It is quite difficult to set up criteria for deciding what should be considered on-the-job or informal education. Should a clerk who has been taught how to operate an adding machine be considered to have had this training, if it required only a few minutes of demonstration ? Somewhere a cut-off point has to be made, so that perhaps, it could be accepted that all persons who have been training to carry out specific functions for a period of one year or more, should be tabulated. It will hardly be possible to do a tabulation by type of training, as the variety of types will be too large. This topic, if it is dealt with in the census, is probably more suitably considered under the section on employment. This question could follow the question on occupation, and take the form, « Have you had, in your present, or in any previous occupation, on-the-job training that lasted one year or longer ? » This is a topic that could be dealt with by Ministry of Labour surveys, though it would be interesting to cross-tabulate these data with formal educational attainment and ISCO occupational groups. Some idea as to the nature of this education will become evident from the latter cross-classification.

304. One other factor must be kept in mind when deciding upon how to measure the educational characteristics of the population. This is a field in which international comparisons are of great importance, so that definitions and systems of classification which make these comparisons very difficult should not be used unless they present some overriding advantages.

305. Taking into consideration all that has been said above, the points of greatest interest would seem to be :

a) the number of grades completed.
b) qualifications obtained, by field of study.

306. These data would be shown by the illustrative tabulation below, and taken together they give a good indication of the educational profile of the population.

307. For the kind of studies for which such data are required, they should be cross-classified with the following variables :

i) Occupation (based on International Standard Classification of Occupations)
ii) Age
iii) Sex
iv) Branch of Industry (based on International Standard Industrial Classification).

EXPLANATORY NOTES AND DEFINITIONS FOR THE PREPARATION OF TABLE 17

1. *Educational Characteristics* of the population are measured by :

a) educational attainment defined as highest grade completed (UNESCO definition is « highest level completed »).

b) Highest qualification obtained. This allows for a study of type of education received. Persons appearing in (*b*) must be listed in (*a*) also.

TABLE 17. EDUCATIONAL CHARACTERISTICS OF T
BY AGE, SEX, OCCUPATI

A SEPARATE TABULATION SHOULD BE MADE FOR E

EDUCATION OF POPULATION → OCCUPATION ↓	TOTAL — ALL PERSONS	GRADUATE [illegible]	GRADUATE [illegible]	[illegible]	[illegible]
1. Architects					
2. Engineers					
3. Physical Scientists, Mathematicians					
4. Biologists, Veterinarians, Agronomists, Related Scientists					
5. Professional Medical Personnel					
— Physicians, Surgeons					
— Dentists					
— Other Prof. Medical Workers					
6. University Science Teachers					
7. Secondary School Science Teachers					
8. Administrators, Executives, Managers					
— Employed in Government					
— Directors, Managers, Working Proprietors					
9. University Teachers (except Science)					
10. Secondary School Teachers (except Science)					
11. Teachers not elsewhere classified (not elementary or nursery school)					
12. Economists, Professional Accountants, Actuaries, Statisticians					
13. Social scientists (except economists)					
14. Artists, Writers, Creative Artists					
15. Other Professional Workers					
16. Technicians and Draughtsmen in Science and Engineering					
— Engineering					
— Research laboratory					
— Industrial laboratory Technicians					
— Not elsewhere classified					
— Draughtsmen					
17. Surveyors					
18. Medical, Dental Technicians					
19. Nurses, Professional					
20. Transport and Communications Technicians					
— Deck officers, Engineer Officers, etc.					
— Aircraft Pilots, Navigators, etc.					
— Radio-communications operators					
— Inspectors, Traffic Controllers, etc.					
21. Non-working Foremen (Supervisors)					
22. Primary, Nursery School Teachers					
23. Salesmen of Insurance, Securities					
24. Other Technicians, etc. n.e.c.					

See explanatory notes and definitions on following pages.

1. The post-graduate degrees should also be broken down by field of study. For many purposes a high degree of detail will be useful. This is, however, more important for the measurement of research efforts and potential and is not dealt with in the present volume.

PULATION OF MINIMUM WORKING AGE AND ABOVE, ND BRANCH OF INDUSTRY

USTRIAL BRANCH (SEE NOTES WHICH FOLLOW THIS TABLE)

TAINMENT				HIGHEST QUALIFICATION OBTAINED																		
H NO CATION CATION ON		PERSONS WITH SOME HIGHER EDUCATION, BUT NO HIGHER QUALIFICATION	PERSONS WITH ONE OR MORE HIGHER QUALIFICATIONS	PRIMARY LEVEL	SECONDARY LEVEL				HIGHER LEVEL													
									DIPLOMA, ETC., BELOW 1st DEGREE	FIRST DEGREE	OF WHICH FIELD OF STUDY											POST GRADUATE DEGREES
9 OR 10 GRADES	11 OR 12 GR., ETC.				GENERAL (a)	GENERAL (b)	VOCATIONAL, TECHNICAL (a)	VOCATIONAL, TECHNICAL (b)			NATURAL SCIENCES	ARCHITECTURE	TECHNOLOGY	MEDICAL SCIENCES	AGRICULTURE	HUMANITIES	FINE ARTS	EDUCATION	LAW	SOCIAL SCIENCES	OTHERS (N. E. C.)	

Continued pages 152, 153 →

TABLE 17 (*Cont'd*). EDUCATIONAL CHARACTERISTICS OF T
BY AGE, SEX, OCCUPATI

A SEPARATE TABULATION SHOULD BE MADE FOR EA

EDUCATION OF POPULATION → OCCUPATION ↓	TOTAL — ALL PERSONS	EDUCATION ILLITERATE WITH NO SCHOOLING	 WITH SOME SCHOOLING	PERS NO PRIM SECOND HIGH CERT 1 TO 2 GRADES	 3 TO 4 GRADES
25. Clerical Workers					
26. Sales Workers, n.e.c.					
27. Skilled Manual Workers					
28. Skilled Service and Recreation Workers					
29. Athletes, Sportsmen, Related Workers					
30. Farmers, Fishermen, Hunters, Related					
— Farmers, Farm Managers					
— Farm workers, n.e.c.					
— Hunters, Fishermen, Loggers, Related					
31. Unskilled Sales Workers					
32. Unskilled Manual Workers					
33. Unskilled Service and Recreation Workers					
34. Miscellaneous and n.e.c.					
Total — Labour Force					
Total — Inactive Population					
of whom — in educational system					
Total — Population of minimum working age and above					

See explanatory notes and definitions on following pages.

[1] The post-graduate degrees should also be broken down by field of study. For many purposes a high degree of detail will be useful. This is, however, more important for the measurement of research efforts and potential and is not dealt with in the present volume.

·PULATION OF MINIMUM WORKING AGE AND ABOVE, ·D BRANCH OF INDUSTRY

)USTRIAL BRANCH (SEE NOTES WHICH FOLLOW THIS TABLE)

TAINMENT				HIGHEST QUALIFICATION OBTAINED																		
'H NO CATION , CATION DE		PERSONS WITH SOME HIGHER EDUCATION, BUT NO HIGHER QUALIFICATION	PERSONS WITH ONE OR MORE HIGHER QUALIFICATIONS	PRIMARY LEVEL	SECONDARY LEVEL				HIGHER LEVEL													
9 OR 10 GRADES	11 OR 12 GR., ETC.				GENERAL (a)	GENERAL (b)	VOCATIONAL, TECHNICAL (a)	VOCATIONAL, TECHNICAL (b)	DIPLOMAS, ETC., BELOW 1st DEGREE	FIRST DEGREE	OF WHICH FIELD OF STUDY											POST GRADUATE QUALIFICATIONS
											NATURAL SCIENCES	ARCHITECTURE	TECHNOLOGY	MEDICAL SCIENCE	AGRICULTURE	HUMANITIES	FINE ARTS	EDUCATION	LAW	SOCIAL SCIENCES	OTHERS (N. E. C.)	

2. *Age.* The following age breakdown is suggested :
below 15 years
15 - 24 »
25 - 34 »
35 - 44 »
45 - 54 »
55 - 64 »
65 » and over

3. *Occupation.* The breakdown shown here is based on a regrouping of the International Standard Classification of Occupations. See Annex VIII for further details.

4. *Branch of Industry.* This breakdown should be based on the International Standard Industrial Classification :
0 Agriculture, Forestry, Hunting and Fishing
1 Mining and Quarrying
2-3 Manufacturing
  31 Manufacture of Chemicals and Chemical Products
  32 Manufacture of Products of Petroleum and Coal
  34 Basic Metal Industries
  35 Manufacture of Metal Products, Except Machinery and Transport Equipment
  36 Manufacture of Machinery, Except Electrical Machinery
  37 Manufacture of Electrical Machinery, Apparatus, Appliances and Supplies
  38 Manufacture of Transport Equipment
  39 Miscellaneous Manufacturing Industries
4 Construction
5 Electricity, Gas, Water and Sanitary Services
6 Commerce
7 Transport, Storage and Communication
8 Services
  811 * Government Services : Defence
  812 * Government Services : Public Administration
  821 Educational Services
  822 Medical and other Health Services
  823 * Research and Scientific Institutions
  89 * Other Services
9 *Activities not adequately described*

5. Illiterates who have received some formal education are distinguished from those who have not, so they can be subtracted from the total in the first part of the table dealing with educational attainment, in order to avoid double-counting, as they may also appear as having completed some grades.

6. Primary and Secondary Education are not shown separately. The same applies to type of education, at this level. The information on type will be obtained in the second part of the table on qualification. Here one year of general education is considered the same as one year of technical education, and the total number of completed grades of both general and specialised education should be considered.

Whereas it is often difficult to distinguish primary from secondary education, higher education usually forms an easily identifiable homogeneous block. Also in many countries, grades or years of study are not meaningful as far as higher education is concerned. This is why higher education is not shown as a continuation of primary and secondary, showing « grades 13 and 14 », etc. In countries where this is possible, it should be done. Even where grades cannot be shown, those persons who have some higher education should be shown separately from those who have obtained a higher qualification. Part-time education should be estimated in full-time equivalents.

7. Only a very brief summary of qualifications by level are shown here. The same breakdown is given as for the tables on enrolment. However, the amount of detail used by each country in table 10 can be used for this tabulation. As far as fields of study are concerned, only a highly aggregated list is given, but this can be

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* These groups do not correspond exactly to the ISIC classification.

extended a great deal. (See table 6.) Persons obtaining equivalent qualifications through channels other than the formal educational system should be included. Field of study should be shown separately for qualification :

a) below level of recognised first degree
b) First Degree
c) Post-Graduate Degree.

TABLE 18

DISTRIBUTION OF CURRENT PUBLIC EDUCATIONAL EXPENDITURE BY LEVEL AND TYPE

308. This table will provide the basis for an analysis of current educational expenditure upon which plans for future development can be based. When the information is available for several years it will be seen in which directions expenditure is increasing or decreasing relatively.

309. Total current expenditure is divided into two major items : final expenditure on goods and services and transfers to students in the form of aid and assistance of various kinds. This should include direct transfers of sums of money to students only. Indirect aid, in the form of services provided at less than market price to pupils and students, is already included in expenditure on goods and services. It should be noted in particular that only *final expenditures* are shown in this table. This avoids untangling the complicated problem of sources of finance. A detailed scheme for treating the problem of sources of finance is contained in Annex V.

310. The information should be available for public and private education, by region, and finally when detailed planning is being carried out, it will be necessary to consider the financial conditions prevailing in the particular location of a new educational institution. It would also be useful to relate current educational costs to the size of institution, as is proposed in the table for capital expenditure.

TABLE 19

CAPITAL EXPENDITURE BY BRANCH OF EDUCATION AND PRINCIPAL TYPE OF EXPENDITURE

311. The information from this table would provide the basis for the analysis of present and past capital expenditures. One particular problem in measuring annual capital expenditure is the definition of work actually undertaken during a year. Figures of capital expenditure often refer to any one or combinations of four concepts :

i) Funds appropriated during the period ;
ii) The estimated cost of projects started during the period ;
iii) The estimated value of work actually undertaken on capital projects during the period ;
iv) The total cost of projects completed during the period but which may have been begun in an earlier period.

All of these concepts have some value, but for planning purposes number *iv)*, although apparently artificial, is most useful for the calculation of reasonably reliable estimates of costs per student place and other planning

TABLE 18. DISTRIBUTION OF CURRENT PUBI

FINAL EXPENDITURE ONLY →	DIRECT EXPENDITURE FOOR GO						
	GENERAL ADMINISTRATION	INSTRUCTIONAL EXPENDITURES		OTHER CURI			
TYPE OF INSTITUTION ↓		WAGES TEACHERS' SALARIES	OTHER INSTRUC. EXP.	CANTEENS DINING FACILITIES	TRANS-PORTATION	LIBRARIES TEXT-BOOKS	HEALTH,
Pre-primary							
Primary							
Secondary :							
general							
technical							
Higher :							
Universities and equivalent (degree granting)							
Other Higher							
Other Institutions							
Expenditure not classifiable by institution							
Total							

coefficients[1]. Numbers *i)* and *ii)* are more important for budgetary and fiscal purposes.

312. It is useful to divide capital expenditures into :

i) costs of land and site improvement ;
ii) building costs ;
iii) costs of fixed equipment and other large items of equipment.

TABLE 19. CAPITAL EXPENDITURE BY BRANCH OF EDUCATION AND PRINCIPAL TYPE OF EXPENDITURE

CAPITAL EXPENDITURE → INSTITUTIONS BY LEVEL ↓	LAND (ACQUISITION AND DEVELOPMENT)	BUILDING	EQUIPMENT	TOTAL CAPITAL EXPENDITURE
Pre-primary				
Primary				
Secondary — Total				
general				
vocational, technical				
Higher — Total				
Universities				
Equivalent institutions (degree-granting)				
Other				
Other Institutions				
Total All Institutions				

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[1] See table 20.

UCATIONAL EXPENDITURE BY LEVEL AND TYPE

D SERVICES			TRANSFERS TO INDIVIDUALS					TOTAL CURRENT EXPENDITURE	INTEREST PAYMENTS AND LOAN CHARGES	TOTAL CURRENT EXPENDITURE
PENDITURE FOR :			PENSIONS AND PENSION FUNDS FOR TEACHERS	(AID TO STUDENTS)						
RECREATION	MAINTENANCE EQUIPMENT ETC.	OTHER (SPECIFY)		GRANTS	LOANS	PRE-SALARIES	OTHER FINANCIAL ASSISTANCE			

Apart from the intrinsic value of such a breakdown for the analysis of the components of capital expenditure, it is valuable for purposes of projection[1].

Table 20

AVERAGE CAPITAL COST OF NEW STUDENT PLACES BY BRANCH OF EDUCATION AND SIZE OF INSTITUTION

313. This table provides one of the basic coefficients for estimating future capital expenditures. It can be considered as being derived from the previous table on capital expenditure and estimates of number of new places provided. However unless information on capital expenditure is carefully compared with numbers of new places provided serious miscalculations may occur. The number of new places coming into operation each year is determined by the projects completed during a year ; and unless estimates of expenditure are made on this basis, numbers of new places will not be compared with the cost of providing these places. Alternatively estimates of costs per student place might be made directly from the accounts of building contracts placed and work undertaken. The aggregation of such budgetary information to provide aggregate coefficients for global planning may present certain difficulties.

314. Some components of capital costs (e.g. land costs) are not closely related to student numbers and it may therefore be useful to distinguish at

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[1] For a full discussion of this topic see *The Effective Use of School Building Resources*, by Guy Oddie (OECD 1966).

TABLE 20. AVERAGE CAPITAL COST OF NEW STUDENT PLACES BY BRANCH OF EDUCATION AND SIZE OF INSTITUTION

SIZE[1] AND TYPE OF INSTITUTION	AVERAGE COST PER NEW PLACE
Pre-primary :	
enrolment : less than 50	
51 to 100	
etc.	
Primary :	
enrolment : less than 50	
51 to 100	
101 to 200	
201 to 300	
etc.	
Secondary :	
general :	
enrolment : less than 50	
51 to 100	
101 to 200	
201 to 300	
etc.	
technical, vocational :	
enrolment : less than 50	
51 to 100	
101 to 200	
201 to 300	
etc.	
Higher :	
Universities	
Equivalent (degree-granting) institutions	
Other Institutions	

1. Size should refer to the enrolment capacity for which the institution is planned.

least building costs proper from land and associated costs. Apart from location the principal determinants of variations in the cost of providing a student place are size of institution[1] and type of curriculum[2]. It is, therefore, recommended that these factors be distinguished in compiling estimates of cost per new student place.

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[1] Costs per place of two and three classroomed primary schools completed in 1961/62, by enrolment capacity. Ireland.

Number of Pupil Places per school	48	64	80	96	104	112	136
Costs per place (£)	102	95	93	89	82	81	78

Source : Investment in Education, Annexes and Appendices, Report of the Survey Team appointed by the Minister of Education, October, 1962.

[2] In Great Britain the average cost per new university place in 1964/65 was £ 1,500 in Arts and Social Studies, £ 3,400 in Pure Science, and £4,800 in Applied Science. *Source* : Figures communicated to OECD by the Statistics Division of the Department of Education and Science, November, 1966.

TABLE 21. SALARIES OF QUALIFIED TEACHERS IN MAINTAINED PRIMARY SCHOOLS

	£520 — 599	£600 — 699	£700 — 799	£800 — 899	£900 — 999	£1000 — 1199	£1200 — 1399	£1400 — 1599	£1600 — 1799	£1800 AND OVER	TOTAL	AVERAGE SALARY
Men :												
Age groups :												
Under 25												
25-29												
30-34												
35-39												
40-44												
45-49												
50-54												
55-59												
60 and over												
Total (*a*)												
Women :												
Under 25												
25-29												
30-34												
35-39												
40-44												
45-49												
50-54												
55-59												
60 and over												
Total (*b*)												
Total — All teachers												

Source of Example : *Statistics of Education* — England and Wales (Ministry of Education, London, 1962).

TABLE 21

SALARIES OF QUALIFIED TEACHERS IN MAINTAINED PRIMARY SCHOOLS

315. England and Wales have been used as an example for the presentation of data of teachers' salaries. The salaries include the base wages plus various other benefits accruing to teachers. A study on the structure of salaries would have to show the different elements constituting the entire salary.

316. The remuneration of teachers is usually the resultant of several factors among which the most important are,

- qualification
- level of education
- seniority
- sex, in some countries
- number of children.

317. Separate tabulations should show the most important of these factors.

318. When total remuneration of teachers cannot be estimated, supplementary data should show the amount of, or relative importance of the various fringe benefits, by level, qualification, and if possible, by age.

Chapter VIII

THE COLLECTION AND PROCESSING OF DATA

METHODS OF OBTAINING STATISTICS

319. As will be apparent from the notes to the tables in the preceding chapter there are essentially six ways in which the basic statistical data for educational planning can be obtained. They are not mutually exclusive, and a well organised programme of educational statistics will utilise all six. They are :

i) Regular censuses of pupils in all educational institutions.
ii) Regular sample surveys of pupils in all educational institutions or in a sample of educational institutions.
iii) Ad hoc surveys at irregular intervals.
iv) Population censuses.
v) Sample surveys drawn from the total population, probably in conjunction with population censuses.
vi) Routine reporting of data obtained as a by-product of educational administration.

320. It should be stressed that not all educational data need to be collected annually, and not all need to be collected from the total population. For many types of flow data, yearly intervals are appropriate, corresponding to the normal length of time spent by pupils in each grade. However, much information can be collected less frequently and from sample surveys. Frequent data collection is not necessary where the attributes of the population being surveyed change only slowly. Conversely, some data may be collected more often than annually, for example, information about attendance of courses of less than a year's duration.

THE USE OF AN INDIVIDUALISED DATA SYSTEM FOR THE COLLECTION AND PROCESSING OF STATISTICS

321. Whichever of the six methods is used for obtaining data, there are two basic approaches to the collection and processing of the statistics.

i) *Aggregate Lists.*

A certain amount of aggregation and preliminary processing of data can be done by the basic reporting unit — usually the educational institution. Thus, for example, the school reports the total number of pupils in each class, the total number of teachers in the school, etc. This is one of the traditional methods of educational data collection. Except in rather complex forms this method is inadequate for the collection of flow data.

ii) *Individual Reporting.*

In the case of individual reporting, instead of the educational institution submitting *aggregate* data for the entire institution, the institution submits information on each component of the aggregate (these components can be pupils, teachers, buildings, etc.). The reporting can be the result of answers to questionnaires filled out by the individual himself, or by teachers or other responsible authorities. The information thus obtained is processed by the statistical authorities, who can aggregate it in a number of different ways according to specific needs. This method of data collection and processing is invaluable for compiling « flow » tabulations of the type discussed in this handbook ; it is usually called *An Individualised Data System.* Under an I.D. System, once the constant characteristics of an individual have been recorded they need never be reported again.

322. The main advantage of an individualised data (I.D.) system is that is permits the follow-up and recording of the educational experience of each pupil and/or teacher. Every new experience, in particular every change in the educational activity of a pupil or teacher, should be related to his earlier activities and experiences. Therefore, each pupil and/or teacher must be given a unique indentification mark which is stored in a register along with information on certain of his individual characteristics such as date of birth and sex[1]. In many ways it is better to regard an I.D. system not as a technique of data reporting but rather as a means of data processing, although, use of this processing technique will have important consequences for the way in which data are collected. But, in principle, each of the six data reporting methods of paragraph 320 can be based on individualised data. The essence of the I.D. system is extremely straightforward. On entering the educational system or branch of education covered by the I.D. system, the pupil, parent, or somebody else on his behalf, completes a questionnaire on which is recorded information concerning the pupil's home background as well as basic information such as sex, date of birth, etc. It would also be possible to record certain psychological facts about the child, if these were thought relevant to his subsequent educational career. Each individual covered is given a unique indentification mark, which can be determined in a variety of ways :

i) a serial number can be allocated by a central authority ;

ii) each educational institution can have a root number on to which it adds a serial number for each pupil ;

iii) it can be the same as an existing registration number, in countries where all citizens are registered ;

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[1] See also Annex III, « Organisational and Technical Aspects of the introduction of Individualised Data for German university Statistics » based on a paper by Dr. H. Kallmer and Dr. H. Zindler.

iv) it can be a code constructed from such *constant* characteristics as family name, christian name, sex, date of birth, place of birth, etc.

323. Each of these methods of numbering has advantages and disadvantages, the most important of which may be briefly mentioned. In the case of *i)*, there is theoretically no possibility of error; on the other hand it is rather cumbersome and pupils will have to remember a number of several digits, which they may not require for any other purpose. Number *ii)* has the advantage that it helps to integrate into the individual pupil data, information on the institution he attends, which may be important for estimating his probable future career, but there are serious problems of linking the individual's record when he moves to another institution[1]. In countries where all citizens are already registered for other purposes (tax, national insurance, identification cards, etc.) it is most convenient to use this existing registration mark. In the case of *iv)*, there is the advantage that the identification mark can always be reconstructed if the pupil writes down his name, date of birth, etc. The code can be manually constructed and transcribed on to data cards for computer processing from the characteristics reported in the questionnaire, or, in a more advanced computer system, mark sensing devices can be used to read the characteristics directly off specially designed questionnaires, and hence to compose the code mechanically. By a suitable choice of factors, such as name, birth-date, etc., that form the identification codes can be reduced to proportions that are statistically negligible. This method may be politically more acceptable in some countries, since it involves no explicit numbering of individual[2]. Methods *iii)* and *iv)* have the advantage that the I.D. system can more easily continue to be used after the pupils have left school, since they will have the same identification code in adult life as well. This, of course, would help in the establishment of the manpower flow accounting framework suggested in chapter IV. It would enable the pupil flow matrix to be readily linked with the manpower flow matrix.

324. All the information from the questionnaire is collected by the statistical authorities who place it on a central register of pupils. The information in the register must be stored in a medium such as magnetic tape or discs and processed by electronic computer. It could, in principle, be maintained by manual methods, but the amount of data to be processed is likely to be very substantial, and the required degree of accuracy difficult to ensure. Once the basic data on the pupil has been stored, information about his subsequent educational experience can be transmitted to the statistical authorities in two ways:

i) It can be reported each time a change of grade or any other change which is considered significant for the pupil's educational career takes place. In this case, the recording and the reporting of the changes may well be done by the school-administration.

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[1] If the ID system starts only after the end of primary education, as may be thought adequate in countries where flows of pupils in primary education are considered straightforward, an interesting possibility is to give pupils a code number which reflects their primary education experience. This would facilitate subsequent analyses of secondary school progress in relation to primary school experience. See, *A School Cohort Coding System*, by L. Goldstone. Mimeographed paper. [illegible]

[2] For a fuller description of this method see *Annex III* on the German experience.

The central register will be subject to continuous up-dating. The principal weakness of this method of reporting is the organisational problem of ensuring that all relevant movements of pupils are reported in a routine manner.

ii) It can be gathered periodically from the individual questionnaires, for example, each school term, or once a year. These periodic reports will record the current activity of each pupil. It is, therefore, very important to keep the time intervals short enough so that no relevant changes between two periods are overlooked. Thus, a comparison between two successive reports will yield all significant information about a pupil's educational progress between the two points in time. If the time interval between two reports is too long, this system has the weakness that unless special precautions are taken — which will increase the complexity of reporting the basic information — only net flows of pupils between the two reporting periods will be recorded.

225. Educationally significant experiences which should be reported include change of grade, leaving a particular institution, entering another institution, passing an examination, failing an examination, etc. It would also be desirable that certain changes in the pupil's home circumstances should be recorded, death of a parent, change of father's occupation, etc. The individual record of every pupil should in any case contain information on certain characteristics of the educational institution which he is attending. In addition, it would be an advantage for forecasting as well as for research purposes if individual characteristics of the pupils were made available together with their educational experience. For example, constant characteristics like social and ethnic background, and also information about the health of the pupils could usefully be recorded. Even if some of these other characteristics are not obviously related to educational experience, they would permit a large number of hypotheses to be tested, the results of which could provide the planner or forecaster with more efficient tools.

226. With this information and with the retrieval capacity of modern computers, the statistical authorities would be able to reproduce at will the educational experience of any group of pupils however narrowly defined, within the constraint of the basic information that is contained on the individual pupil's questionnaire or questionnaires, and the number of different educational activities that have been defined. It would enable tables on the basic stock and flow characteristics of pupils to be printed out in a routine manner, with the possible exception of certain information on part-time education and informal training outside educational institutions, which may prove difficult to record or to fit into this framework. It would thus be possible to develop and test empirically a wide range of forecasting, simulation and planning models.

227. The development of a similar central register of teachers would enable information on the basic stock and flow characteristics of teachers to be readily printed out.

228. In addition to the ease with which most of the basic tabulations necessary for educational planning can be provided by an individualised data system, a considerable amount of information can be stored which can

be made available to educational planning bodies or research workers on request[1]. For example, detailed breakdowns could be provided by individual school district and by type of educational institution, different cross-tabulations could be made, and so on. The real constraints are not technical but economic, and depend on how many resources a nation is willing to put into its system of educational statistics.

329. It is, in fact, very probable and it is certainly desirable, that individualised data systems along the lines of those sketched out above will provide the main framework for the whole system of educational statistics in most countries. The conjunction of the growing interest in educational planning and the growing sophistication of educational planning methods, with the prodigious development of automatic data processing methods makes this development a near certainty.

330. It must not be imagined, however, that all the problems of individualised data systems have been solved. There is still in many countries likely to be considerable resistance to the idea of a centralised individual record for pupils. The information that can be stored may be severely circumscribed by public opinion, particularly if this information is to be also used for administrative and educational purposes, such as assessing the child when he enters a new educational institution.

331. However, care must be taken not to divorce the statistical data gathering and processing entirely from the administration of education. If it is a legitimate criticism of existing educational statistics that their collection has been excessively influenced by administrative needs and administrative convenience, it would be equally wrong to go to the other extreme and orientate data gathering entirely towards the needs of the planners. Care must also be taken to ensure that there is an efficient and rapid feedback of information from the central register to the level of local and school administration. Large institutions, such as universities, often have computers for their own data collection requirements. In such cases, direct data transmission avoiding all manual clerical work, can be made from the computers of the institutions to those of the central statistical offices, by means of punchcards or teleprinter.

332. The number of pupils in large countries makes the sheer amount of data to be handled a formidable problem. One way of dealing with this problem which is particularly acute if the data are to used in forecasting models of the type described in this handbook, is to centralise the records of only a sample of pupils, perhaps only those born on certain dates randomly distributed throughout the year. If the data are also to be used for administrative purposes it may be necessary to collect the information for the whole school population on a standardised form. The central register to be used for planning purposes would, however, contain only a random sample of pupils.

333. The question has been raised whether it is necessary to have an individualised data system for pupils in compulsory education. By excluding the compulsory sector, one could eliminate at least 36 million of the pupils from the register in the United States and 8.5 million in France.

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[1] It may be necessary to adopt stringent safeguards to ensure that data on individual students do not fall into the wrong hands.

Within compulsory education, if it is effective, it is sometimes assumed that progress by grade is fairly regular, and that for most purposes the basic « stock » tabulation of pupils by age and grade is adequate for compiling flow tables. It must be remembered, however, that, as has been pointed out previously, many important decisions are often made within compulsory education which have a marked effect on pupils' subsequent educational careers. To the extent that the educational planner wishes to « explain » the transition coefficients as a basis for better prediction, rather than merely to record them for mechanical projection, analyses are necessary which link these decisions within compulsory education and the factors affecting them, to subsequent educational careers. It is preferable that such links be made through the individualised data system. The need to have an individualised data system for all branches of education, including compulsory education, is strengthened where there are high rates of repeating and dropouts in compulsory education. It seems, for example, that the rate of progress in elementary schools in the U.S. is much less normal and constant than is often assumed. According to estimates based upon the 1950 population census, a quarter of all fourteen-year-old Americans in 1950 were lagging behind the school grade which corresponded to their age norm.

234. Many of the systems of individualised data collection currently in use are restricted to one branch of education and even to one type of institution. While this may be desirable for purposes of pilot experiments, it very severely limits the usefulness of such data for planning purposes. Most of the transitions of pupils which are really important to educational planners are those between types and levels of education. One of the major purposes of individualised data from the point of view of the educational planner, is to enable individual pupils (or groups of pupils with certain specified characteristics) to be identified as they pass from one type of institution to another. Much of the value to the planner of individualised data is lost if such statistical links cannot be made. While, therefore, it may be desirable to establish such a scheme on a small scale in particular institutions in order to iron out the difficulties, the aim should be to extend it to cover all institutions (at least the last grade of compulsory education and above). Administrative and technical arrangements in the early stage should be made with this in view.

235. A major task in all individualised data system is the updating of the central register. Each time that new data on a particular pupil arrives his identification code must be found and the new information added to his file. With a perfect reporting system this is quite a straightforward task. However, problems arise with the new identification codes that appear and those that disappear during each reporting period. It is necessary to ascertain whether new identification marks are really new pupils, whether they are re-entrants or whether they are merely incorrectly recorded identification codes; it is necessary also to ascertain that identification codes that have disappeared really represent pupils who have left the educational system. These technical problems of data processing are not really within the scope of the present handbook, they are dealt with to some extent in the *Annexes*, but they do indicate that there are technical problems to be faced in establishing such a system.

236. Closely related to this problem is that of the speed with which the

processed data are made available. One of the most important deficiencies in existing educational statistics, as in many fields of economic and social statistics, is that they are frequently out of date by the time they are published. While this may not be disastrous for long-term forecasting, it is very important for many types of short-term forecasts — for predicting university applicants on the basis of pupils in final year of secondary school, etc. Such information can help to avoid short-term disequilibria between places available and demand for places in various educational institutions that occur through incorrect estimates of the demand. In principle an individualised data system should permit the rapid publishing of statistics. Unfortunately this has not always proved to be the case.

337. It is vitally important in establishing a computerised individualised data system to be sure about what information is sought and what information on the questionnaire will provide it. Administratively and technically the machinery of such a system is rather substantial and it is unlikely to be easy to introduce changes in the basic questionnaires. Individualised data on pupils and teachers, like all statistical information, can serve a number of different purposes, ranging from the preparation each month of the salary cheques of individual teachers, to long-term forecasts of pupil numbers in any branch of education, and the data needs are not necessarily the same for each. The purpose of the present proposals is to indicate the basic information that the planner should hope to obtain from his national system of educational statistics ; he must not forget, however, that educational administrators at all levels also have considerable data needs and so do educational research workers.

338. It is strongly recommended that where they have not been made, studies be undertaken to investigate the likely costs and benefits of establishing central registers of pupils and teachers, and the individualised data systems upon which the maintenance of the register depends. The full establishment of such a system for pupil statistics is likely to be a rather long-term operation and ought to comprise the following steps :

i) Preliminary cost/benefit studies ;
ii) Establishment of computer programmes, initial administrative arrangements for data recording, etc., draft tabulation scheme, etc. ;
iii) Pilot studies in one or two institutions ;
iv) Extension to cover all of post-compulsory[1] and higher full-time education (possibly on a sample basis first) ;
v) Extension to cover pupils in all formal educational institutions.

Similar procedures may be followed in establishing a centralised teacher register. It is sometimes convenient to start with a teacher register since such a register can serve many administrative purposes connected with salary payments, etc.

339. The initial costs of establishing an I.D. system are likely to be high. However, it is probable that these costs will be offset by substantial returns ; first, an I.D. system provides considerably improved data ; second, this improved quantity and quality of data, makes a far more varied and interesting set of analyses possible ; third it may make it possible to reduce

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[1] It is important to include pupils in the final year of compulsory education.

the burden of reporting and aggregating data by individual institutions and headmaster.

Annual Censuses of Educational Institutions

340. In a sense nearly all regularly collected educational statistics result from censuses of educational institutions, and a census of educational institutions does not preclude the central register and individualised data system of the preceding paragraphs — on the contrary a census is likely to be much easier to carry out, if an I.D. system is in operation.

341. A census of educational institutions, like a census of manufacturing industry, or a census of households, merely implies that the person responsible for administering each institution answer a number of questions concerning his institution. For the most part these questions would deal with the pupils and teachers in the institution but they can also concern equipment, finance and the school buildings.

342. An important question is that of the date of the census. Some experts suggest that it ought to take place about mid-way through the school year in order to obtain a figure of average attendance. From many points of view, however, it is preferable to collect the data as near as possible to the beginning of the school year — they thus can be made available much earlier, which is important for many administrative and short-term planning purposes.

343. Another problem not unconnected with the previous question of timing concerns who or what should be recorded. According to the strict rules of population census-taking, only those pupils and teachers actually in school on the day of the census should be recorded. This, however, would certainly underestimate the actual number of pupils attending regularly, since there will usually be less than 100 per cent of regular attenders in school on any given day. On the other hand, it can be claimed that merely to record all pupils on the school register may tend to overestimate attendance since, at least beyond compulsory education, there are always some pupils who drop out during the course of the year. There is, however, no real alternative to that of recording all the pupils who are on the school register at the time of the census, with the proviso that everyone should be struck off who has not attended for a certain number of days before the census (unless it is due to a temporary illness, etc. of which the school has been officially notified). All teachers should be recorded who are employed in the institution at the time of the census and who have given no official notification of departure, whether or not they are actually attending on the day of the census.

344. Where a teacher is teaching in more than one institution a problem of possible double counting arises. An I.D. system would of course avoid the problem since the separate records of the teacher's activity would be marked in the central register. Where this cannot be done it is proposed that teachers be asked to report any teaching done in other educational institutions and to specify which, as well as the number of hours of teaching done.

345. As has been indicated above, a census of educational institutions has rather different meanings depending on whether or not an I.D. system

is in operation. Where it is carried out in conjunction with a complete I.D. system the basis of the census would run along the following lines:

i) All students who had not previously attended any educational institution within the country or who had attended one not covered by the I.D. system, would complete a detailed record card. This card would contain information which would permit the construction of a code which would become thenceforward the pupil's individual identification mark.

ii) For persons already on the central register, the relevant information on any activities engaged in during the two census periods is recorded and sent to the register for up-dating.

346. There would be a similar procedure for submitted information on teachers. Where the I.D. system is fully established new teachers direct from training would be automatically transfered from the pupil register to the teacher register. In cases where there is not a fully operative student register, all new teachers would complete a record card summarising relevant features of their previous experience and would be put onto the central register. At the same time information on their salaries and on the amount of specialised teaching and general teaching done by each teacher, and any other information about their activities that was considered relevant would be reported.

347. Except, therefore, for the detailed information on the new pupils and the new teachers, which could be obtained from the individuals when they entered the institution, the amount of work of the school administration would be to some extent simplified.

348. Where the census was not carried out using an I.D. system it would be necessary to ask each year for the total number of pupils in each institution by age and by sex as well as by grade and branch of study. In addition it would be necessary to ask for information on any characteristics of pupils that were considered important. If the attempt is to be made to construct flow tabulations of the type indicated in chapter II it would be necessary in addition to cross-classify this information according to grade, branch of study in previous year, etc. Without some sort of means of identification of individual pupils such a questionnaire would be quite complicated. Similar considerations apply in the case of teachers.

349. What distinguishes a system of data collection based on individualised data and a centralised register from traditional systems is that in the one case information on the permanent individual characteristics of pupils would need to be recorded only once (when the pupil or teacher first entered an institution covered by the system) and all the matching of current educational activity with previous experience and with individual characteristics would be done by the central statistical authorities, whereas if there is no I.D. system all the information that is required on individual characteristics of pupils at any point in their educational career must be collected specially each time that it is required.

350. In concluding this section on annual censuses of educational institutions the often made remark may be repeated, that most economically advanced countries now have, at frequent intervals, detailed data on the size, structure, age, geographical distribution, etc., of their agricultural live-

stock population, but they sometimes still do not know even the total number of pupils in different branches of education — the most important gaps being part-time schools and private schools. In most countries, farmers (who are not renowned for their favourable attitude to central authorities) submit detailed census returns every year and sometimes every quarter year about number of livestock, by age, sex and type, acreage of various crops, etc. It is not unreasonable to suppose that educational establishments, public and private, should undertake a similar task. The justification for agricultural censuses is the need for government intervention to protect farm prices, incomes, etc. and that, therefore, the authorities have the right to statistical information that will help to indicate the likely effects of alternative lines of policy. The existence of similar justification in the sphere of education is almost universally recognised[1].

351. The necessity for the census to include both publicly and privately controlled institutions, and also various forms of part-time education cannot be stressed too strongly. Even where there is no intention of intervention in these areas by the public authorities it is vital for the State to have information on the extent to which such types of education and training can and do operate as substitutes for state education.

352. Finally in this section it may be repeated that the census of educational institutions is necessary whether or not it is linked to a system of individualised data collection and a central register of pupils and teachers.

SAMPLE SURVEYS AND AD HOC DATA COLLECTION

353. As has been stressed several times in the preceding paragraphs, not all the statistical information required by educational planners need be collected regularly or with respect to the total pupil or teacher population. In the first place, many of the data may be rather difficult to obtain and frequent collection from the total population may be unnecessarily expensive. Secondly, many of the coefficients required, for example, for the detailed flow tabulations, are unlikely to change rapidly. Thirdly, where it is not a question of measuring the size of the pupil or teacher population, but of estimating the extent and distribution of various characteristics of the population, good sampling procedures will permit estimates almost as reliable as total population counts. A rather different factor is that some information may be required in some branches of education that is not relevant, or not important in other branches.

354. Recommendations of a general nature cannot be made about the conduct of such surveys, which will depend on the specific objectives of each. Attention should be devoted, however, to the problem of establishing a sampling frame suitable for a number of different purposes. Where it is characteristics of pupils and teachers that are being surveyed, it is desirable that the sampling frame be based on individual pupils and teachers independently of the institution in which they study or teach.

355. It would clearly be desirable that the data suggested for triennial

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[1] It must also be recognised, of course, that in countries with a long tradition of church or other private sector education, it may be necessary for the public authorities to operate through the appropriate authorities.

or quinquennial data collection should be fitted into the framework of the regular annual censuses of educational institutions. It is suggested that the annual census contain one part which consists of the regular count of pupils and teachers to provide the basic stock and flow tables, and a second part which would change from year to year that would contain questions on various characteristics of the pupil and teacher population and about the state of buildings and equipment, etc.

356. Once again, it should be stressed that sampling procedures can be used in conjunction with an I.D. system. For statistical and planning purposes there are no technical reasons why an I.D. system should cover all members of a population, though if the data are also to be used for administrative purposes, e.g. payment of teachers' salaries, full coverage will be necessary.

357. One minor technical point may be made about the use of sampling procedures in connection with an I.D. system. This is simply that the same sample of pupils must be observed at each point in time otherwise the linking of individual pupils at different points in time is almost impossible. If for example a 10 per cent random sample is taken in one year and a separate 10 per cent random sample the following year only about one per cent of the pupils will appear in both samples. One of the best methods of selecting the sample to overcome this problem is to select all pupils with certain birth dates distributed throughout the year and to select the same birth dates in subsequent years.

Population Censuses and Surveys

358. Much of the information on the educational characteristics of the population at large can be obtained only from general population censuses and surveys associated with them. It is not a part of this handbook to provide a guide to population censuses. It is, however, important that the educational planner be fully aware that the demands made on the census are substantial and that it is quite impossible for the census authorities to accede to all requests from all sources for all the information that it would be useful to have from the population census. It is necessary therefore to have a well determined system of priorities in making requests to the census authorities. It is also important that educational planners acquaint themselves thoroughly with their national procedures for preparing the census schedule. In some cases, it appears that educational planners prefer to complain after the census that the information they require was not collected, or not collected in the form they wanted it, rather than to ensure that their views are felt while the census is being prepared. Preparation for full population censuses often begins some five years before the census actually occurs.

359. Since there are substantial demands on the population census, and since it is rather a blunt instrument, able conveniently to deal in only rather broad aggregates, and of which the results are often published only after a considerable delay, it is recommended that information be sought from the census only when it cannot be conveniently obtained elsewhere. In practical terms this means that detailed information on the school population should not be sought from the population census, except where it is necessary to

compare characteristics of the school population with characteristics of the population not in school.

360. The educational planner should be aware of the related subjects to be covered by the census, with which he might wish data on educational characteristics to be cross-tabulated. He should assure himself that the information on such characteristics which may be required primarily for other purposes should be collected and processed in such a way as to permit the tabulations he requires. This applies particularly at the early processing stage, where he should be sure, for example, that proposed occupational groupings are appropriate, or that the information on the population by individual year of age for the age group 0-30 is not lost in the initial transfer of the data of the census returns. The supplementary characteristics of the population with which it may be desirable to cross tabulate educational data include: age, sex, occupation, branch of economic activity, employment status, area of residence and work.

361. It should also be borne in mind that some information that cannot be collected from the total population census may be obtained from sample surveys associated with the census or from follow-up studies[1]. One warning that should be made about such sample studies particularly of highly qualified manpower in small countries is that the probability of sampling errors is likely to be quite high if detailed cross tabulations of the data are sought, since the population of highly qualified manpower is rather small. The more information that can be obtained from the total census to aid stratification of the sample, the more such errors can be reduced. These and related problems will probably become more important in the near future since, in many countries, there is a tendency towards relying more and more on sample surveys for obtaining detailed information rather than total censuses. This trend results from the twin desires to have more detailed information and to have it at more frequent intervals. Improvements in sampling methods and facilities for data processing help to make it possible.

362. The treatment of educational characteristics in previous population censuses has varied enormously, between countries and between censuses in the same country[2]. This puts an additional constraint on the data to be requested from future censuses. Since one of the uses of data on educational characteristics of the adult population is to investigate changes in the stock and distribution of such manpower as economic development proceeds, it is vital to be able to relate the data of successive censuses. This means that, however desirable it is to develop new ways of treating the measurement of the educational attainment of adult population, it is also necessary to be

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[1] See, for example, the *Postcensal Study of Professional and Technical Manpower of the United States*, National Science Foundation. This is an extremely detailed study of a large sample of persons recorded in the 1960 census enumeration as college graduates or as persons currently or last employed in scientific and technical positions, whether college graduates or not, to determine relationships between training and subsequent occupations. A detailed statement of this Post-Censal Studies Programme, its background and content, and some notes on data collection, processing and tabulating are reproduced as an annex to this manual.

[2] For example in Greece the 1951 census classified the total population by number of years of formal education received, and the 1961 census distinguished economically active and economically inactive population by highest level of education attained. It is virtually impossible to compare the two censuses.

able to convert at least some of the data into the form of preceding censuses. This is also an area of analysis in which international comparisons can have a very useful role to play and it is therefore desirable even from the viewpoint of an individual country that international conventions be respected as far as possible.

363. Questions on educational characteristics have been asked in the following terms :

a) Number of years of full-time or formal education achieved.

b) Highest level, or cycle within the level (primary, secondary, higher) or highest grade completed.

c) Qualifications obtained : sometimes including subject of specialisation and sometimes including equivalent qualifications gained outside the formal educational system.

d) Age at which full-time education ceased.

364. As has been suggested in the previous chapter in connection with the tabulations of educational characteristics, it is recommended that a combination of *b*) and *c*) including specialisation and qualifications obtained outside the educational system offer the best basis for measuring educational characteristics in the form required by educational planners[1]. However, account should be taken of the need for a link with data from previous censuses.

365. It should be mentioned that there are other types of censuses as well as population censuses which may be utilised by educational planners — censuses of manufacturing industry, censuses of retail and wholesale establishments, agricultural censuses, etc. If used properly these could give considerable insight into the utilisation of qualified manpower, related to investment, productivity, capital intensities and so on[2].

366. Finally in this section the problem of using censuses in connection with an I.D. system may be mentioned. Preparing a census for an I.D. system means that the identification of individual census returns must be possible. Since every unit in an I.D. system has to bear a unique identification mark, the central register would, technically, have the possibility of finding out who has filled in a particular census questionnaire. Given the nature of the information available on each individual, it will be necessary to have legal safeguards that ensure strict confidentiality.

Data that Emerges from Administrative Needs

367. This is in many ways the most convenient way of obtaining statistical data on education since it is merely a question of collecting together the records of various administrative bodies. It is obviously an important means of obtaining the necessary information on educational finance and expenditure, the collection of which depends largely on gathering statistical

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[1] For a discussion of the advantages and disadvantages of each approach see *Statistics for Educational Investment Planning - the statistical needs in the field of educational attainment*, OECD mimeographed document, DAS/EID/65.70, submitted to the Working Party on Statistics of Education of the Conference of European Statisticians, October, 1965.

[2] For an example of the use of such censuses see, *Education and Economic Development, Mediterranean Regional Project*, Country Report, Greece, OECD, 1965.

information from the accounts of the various bodies concerned with allocating and spending the funds devoted to education. It is also a useful means of obtaining information on examination passes and failures. Even school attendance records can be useful in some circumstances.

368. It should also be noted that an individualised data system can be established as much for administrative convenience as to meet the needs of educational planners. It can be used for purposes as varied as scheduling lectures and classes in universities and arranging the payment of teachers' salaries, as well as meeting the needs of longer term planning.

369. The main proviso that must be made is that data gathering for planning purposes must not be too much subordinated to administrative convenience. There are grounds for supposing that this has been the case in the past[1].

370. A comprehensive statistical programme for education should, therefore, consider which administrative records are likely to be useful for longer term planning purposes and make arrangements to have copies of these submitted in a routine manner to the statistical authorities. As stated above, two obvious fields where this should be done are in recording examination results and details of educational finance and expenditure.

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[1] For example, statistics of secondary education and statistics of higher education are often treated entirely separately because of their separate administrative structures, although, as has been pointed out several times in this handbook, for planning purposes it is vitally necessary to link the two.

Appendix

A NOTE ON THE COMPILATION OF FLOW TABULATIONS IN THE ABSENCE OF INDIVIDUALISED DATA[1]

As has been mentioned previously in this handbook, the conceptual framework for the analysis of population flows developed in chapters II, III and IV should be sharply distinguished from the method of data collection and processing known as individualised data, that has been described in this chapter. Although in an ideal system they are closely linked, the one is an analytical framework for the quantitative description of the dynamics of an educational system, the other is a method of data collection and processing, among the many uses of which it is the most convenient method of obtaining data for flow tabulations.

In order to illustrate that the development of flow analysis is not dependent upon the establishment of individualised data systems, the present note shows how estimates of the main transition coefficients can be derived from a system of reporting by educational institutions only slightly more complex than traditional methods. It is hoped that this may be of use in countries that have no immediate prospect of introducing individualised data systems.

The basis of the method proposed is that the data necessary to fill in the *educational* cells of the matrix can be obtained from each individual educational institution. The questionnaire to be completed in each institution would be a short flow matrix of the type previously described in this handbook, with only the parts of the matrix likely to be relevant to the particular institution spelled out in detail. If these individual returns from each institution are summed for all institutions, a flow matrix for the whole school population can be obtained.

Information on all pupils who were in the same establishment in year t_0 and t_1 can be obtained from the school records. For those who were in the establishment at only one of the two points in time there are in principle two possible ways of proceeding :

i) the school administration can attempt to find the destination of all pupils who left the institution between t_0 and t_1.

ii) it can attempt to ascertain the educational activity in the previous year of all new entrants to the school.

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[1] This appendix is based on a note submitted to the OECD Secretariat by Mr. de Bruijn of the Netherlands Statistical Office and Mr. E. Wallberg of the Swedish Central Statistical Office.

In practice, it is clearly almost impossible to use (i), the data being difficult to collect and unreliable. On the other hand, information on the previous year's educational activities of new entrants is reliable, and fairly easily obtained. In this way, all the cells in Table A can be filled in except for the column marked R, which represents the transfers from that part of the educational system concerned by the matrix to the outside world. The components of column R, can readily be deduced by subtracting the sum of all the elements of each row from the row total. The column R corresponds, of course, to persons who were in the educational system in (t_0) but who are no longer there in period (t_1). Thus all the components of a flow matrix have been derived without the necessity of tracing each individual. There is, of course, no way of distinguishing persons who died, emigrated, entered the labour force or became economically inactive. However, age specific death rates are usually available, and emigration figures by age are often recorded. Estimates of age, educational level and specific labour force participation rates can be applied to the remaining portion of R to obtain an estimate of numbers entering the labour force.

TABLE A

TO → FROM ↓	TYPES OF INSTITUTION (1)	(2)	(3)	R	S_{t_0}
(1)	A	B	C	D— (A+B+C)	D
(2)					
(3)					
R					
S_{t_1}					

KEY :

S_{t_0} = Stocks of pupils in time (t_0) ;

S_{t_1} = Stocks of pupils in time (t_1) ;

(1), (2), (3) = Different types of educational institutions ;

R = Outside educational institutions ;

D = Total number of pupils in institutions of type (1) in time (t_0) ;

A, B, C = Distribution in time (t_1) of those members of D who remained in the educational system.

This far it has been assumed that the information will be collected by school types only. It is, however, quite straightforward for each school to make the analysis by grade within the school. The type of questionnaire that a primary school might receive is shown as Table B. If schools also supply information on the age/grade distribution of pupils, an estimate can be made of the age and educational attainment of pupils entering the labour force.

TABLE B. SAMPLE QUESTIONNAIRE FOR PRIMARY SCHOOL

TO → FROM ↓	GRADES IN YEAR t_1						H	TOTAL PUPILS IN YEAR t_0
	1	2	3	4	5	6		
Nursery School	D	D	..	..	..	..		
Other Schools	E	E	E	E	E	E		
Outside Education	F	F	F	F	F	F		
1	C	G	..	..	..	..	h	B
2	..	C	G	..	..	..	h	B
3	..	..	C	G	..	..	h	B
4	..	..	..	C	G	..	h	B
5	..	..	..	..	C	G	h	B
6	..	..	..	..	..	C	h	B
Total Pupils in Year t_1	A	A	A	A	A	A		

KEY:

A = Number of pupils in each grade in year t_1.

B = Number of pupils in each grade in year t_0.

C = Number of pupils in same grade in t_1 and t_0.

D = New entrants from the educational system (nursery schools only).

E = New entrants from the educational system (other schools).

F = New entrants from outside the educational system.

G = Number of pupils who were in same institution in t_0 and t_1 but who were promoted from one grade to the next.

H = Pupils who left the school between t_0 and t_1 (left the system altogether or transferred to another school).

h = Pupils who left the school from each grade between t_0 and t_1.

.. = Cells in which observations are unlikely to be recorded.

NOTE. This table is rather simplified for the sake of exposition. In practice, the rows for new entrants would need to be somewhat expanded so that the previous activity of new entrants could be more precisely identified. This is vitally important for the aggregation of returns from different schools. It is particularly necessary in the higher levels of education where there are substantial transfers between institutions.

Chapter IX

INTERNATIONAL COMPARISONS

Usefulness of International Comparisons

571. Although the planning and administration of education are very largely purely national concerns (in this respect differing from many aspects of economic policy), the problems encountered in the development of educational systems are often similar in a number of countries, and much can be learned from confrontations of national experiences in dealing with particular problems. For such confrontations to be worthwhile, however, they should be based on common terms of reference, and a very important aspect of such common terms of reference is that any statistics that are used must have, as nearly as possible, the same meaning in the different countries involved.

572. In planning a statistical framework for international comparisons there are two different problems.

1. To decide which statistical magnitudes it is useful and relevant to compare.
2. To adopt a system of classification and definitions that are acceptable and meaningful in the countries making the comparisons.

573. The difficulties of making and interpreting international comparisons of educational affairs between countries, or even between different educational authorities in the same country, are well known to anyone who has tried to make them in any but the most superficial way. In part they stem from the fact that educational planners are often not very clear what comparisons they want to make, and in part from the inadequacy of existing data and the imprecision of definitions and systems of classification, but far more importantly they stem from the wide differences in the structures of educational systems and from the fact that the relative distribution of enrolments in the various levels and types of education varies enormously. The Robbins Report[1] summarised the situation thus : « Systems of education can only be compared statistically by forcing them into a common mould. But the structural differences are so great that there must always be some room for argument as to whether like is really being compared with like. »

574. These difficulties can never be overcome entirely satisfactorily, but steps can be taken to ensure first, that the magnitude of the various incomparabilities is minimised by a careful choice of shape for the common

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[1] *Report of the Committee on Higher Education*, HMSO, (London), 1963, *Appendix Five. International comparisons.*

mould, and secondly that the interpretation of the definitions is made explicit, so that the whereabouts and broad limits of possible incomparabilities can be identified. This is what is attempted in the present chapter.

Educational Equivalences

575. It should be understood, however, that there is no detailed consideration in this manual of the question of « educational equivalences » i.e. whether, for example, a university degree has the same significance in country A as it has in country B. In the proposals for internationally comparable tables it is, in general, suggested that existing national definitions are adopted or adapted; in some cases approximate « equivalences » based on number of years' study in various types of education are suggested. It is appreciated that this is a defect; however, many years' work are necessary before it will be possible to establish reliable tables of educational equivalences even for closely similar countries. Even within countries there is much difference of opinion about whether, for example, a first degree in economics from one university is of the same value as an apparently similar degree from another. It is to be hoped, however, that appropriate organisations will undertake such work. This means that at present it will continue to be necessary to supplement statistical tabulations with a certain amount of descriptive information, in the form both of notes accompanying the tables, and of textual commentary explaining the educational systems being compared.

576. In this context it should be noted that the definitions and systems of classification for international comparisons proposed in this handbook cannot as yet be taken as a set of rigid rules. Their validity and the possibility of applying them in individual country situations must be determined in the light of practical experience to be gained from experimental data collection.

Purposes of Comparisons

577. The main purposes that can be served by internationally comparative statistics have been indicated in chapter 6. They are recapitulated below.

i) Data from other countries can supplement national data in the estimation of parameters and coefficients. Included among these coefficients can be considered, the setting of targets as well as the various coefficients that form part of the more sophisticated planning models that have been outlined in this handbook. International comparisons can be an extremely useful first step in setting targets for enrolment ratios, pupil-teacher ratios, manpower structures etc., provided that the comparisons are based on reliable statistics.

ii) They can assist the research worker who is investigating the relationship between education and economic and social development. Such research is of vital importance in the present state of educational planning. Time series data are inadequate for this purpose since it would be necessary to have data for a very considerable number of years, particularly in the case of educational characteristics of the adult population, where, in view of the fact that most people are in the labour force for over 40 years, the degree of autocorrelation between time series observations is likely to be extremely high.

ii) They can provide a reliable quantitative basis for comparative policy studies and confrontations of national policies such as occurs for example in the OECD reviews of national educational policies.

378. It is clearly impossible for any a priori framework to produce all the statistical data that may be required for these purposes since some studies will deal in very great detail with one particular topic, others will be concerned with different topics. For example, a comparative study of student grants or student loans would need to investigate the different possible administrative arrangements using as a basis the tabulations suggested in chapter VI. It would be concerned with their effects on educational participation of different income groups and in the case of loans it would need to consider the likely effects of heavy financial commitments by young people on occupational choice and marriage. Again, an investigation of educational policy in one country might concentrate particularly on the teaching of engineering in secondary schools while another might be particularly concerned with the allocation of university staffs' time between teaching and research. The basic statistical framework should provide a clearly defined point of departure for such studies.

379. There is little reason why all statistics which are needed for planning that have been described in the earlier chapters of this manual should also be required for international comparisons. For example, it is not feasible at present to try to construct internationally comparable flow tabulations of the type shown in the national tabulation scheme. However, proposals are made which would permit some of the most important transfers to be compared[1].

380. For many purposes the statistics published by national authorities can and must be used as a basis for comparisons by other countries as a supplement to more strictly comparable data. It is, therefore, highly desirable that all major publications on educational statistics should begin with a verbal description of the educational system of which the statistical data give a quantitative description. As a minimum the statistics should be preceded by a standardised structure organigram showing the relation to each other of various branches of education, and also in which parts of the system pupils of different ages are likely to find themselves.

COMPARISONS OF PUPIL STATISTICS

Educational Pyramids and Comparisons of Enrolment Ratios

381. The construction of an « educational pyramid » and the calculation of meaningful enrolment ratios are the most solid basis for international comparisons of the magnitude and orientation of educational efforts.

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[1] This does not mean that for many types of international comparative studies it is not appropriate to use the national flow tabulations as a basis for comparing likely educational developments.

382. An educational pyramid is a diagram relating enrolment of each group to the total number of persons in the population of the same age. It can distinguish levels and types of education in which pupils of these different ages are enrolled.

383. Such a pyramid can, in itself, tell a considerable amount about a country's educational efforts, and a comparison of the size and shape of the pyramids for a number of countries at various stages of economic and social development can yield interesting clues about the way the relative importance of different levels of education changes as economic and social development proceeds. The basic data necessary are population by age and number of students classified by age and sex. They can be obtained directly from tables 1 and 9 of the proposed national tabulation scheme.

384. Part-time education, of course, presents some problems and it is necessary to adopt some conventions. In principle, part-time pupils can be considered as being added to full-time pupils in the pyramid and the tabulations from which it is derived, but shown separately. The heavily shaded lines of diagram 1 indicate how part-time pupils might be treated. Conventions are necessary in deciding which part-time pupils to include and how to measure them. It is advisable at this stage to include only pupils who are attending formal educational institutions. If any country wishes to include pupils in formally organized schemes of in-service training outside formal educational institutions they should be recorded separately and a brief description of the relevant training provided.

385. The silhouette shown as diagram 2 is only a silhouette and it masks a number of important features. In the following paragraphs various aspects of this standard educational system which may be relevant for comparisons are considered.

Public and Private Institutions

386. The first complication is caused by the existence of a number of different administrative arrangements for educational institutions. These range from rigid control and complete financing by the central authority to complete financial, administrative and pedagogic independence of any public authority. These two extremes are often characterized as public on the one hand and private on the other and all institutions between the two extremes are fitted into one or the other category with various degrees of difficulty, as where, for example, private control is supported by local authority financing of some students, and inspection by the central authority. In the case of data for national planning it has been suggested that the expression « type of institution » should cover a differentiation by type of administrative arrangements for running the school, e.g. denominational school, local authority controlled institution of higher education, independent institution receiving direct financial grant from Ministry of Education, etc. Some institutions, especially universities, which have a particular administrative and financial organization are considered public in some countries and private in others. Furthermore, in some countries private education has a social class connotation; it provides for pupils who opt out of, or who are incapable of benefiting from the state system; in others, private authorities fill gaps left by the public system (this applies parti-

Diagram 1. EDUCATIONAL PYRAMID AND ENROLMENT RATIOS IN FULL-TIME AND PART-TIME EDUCATION

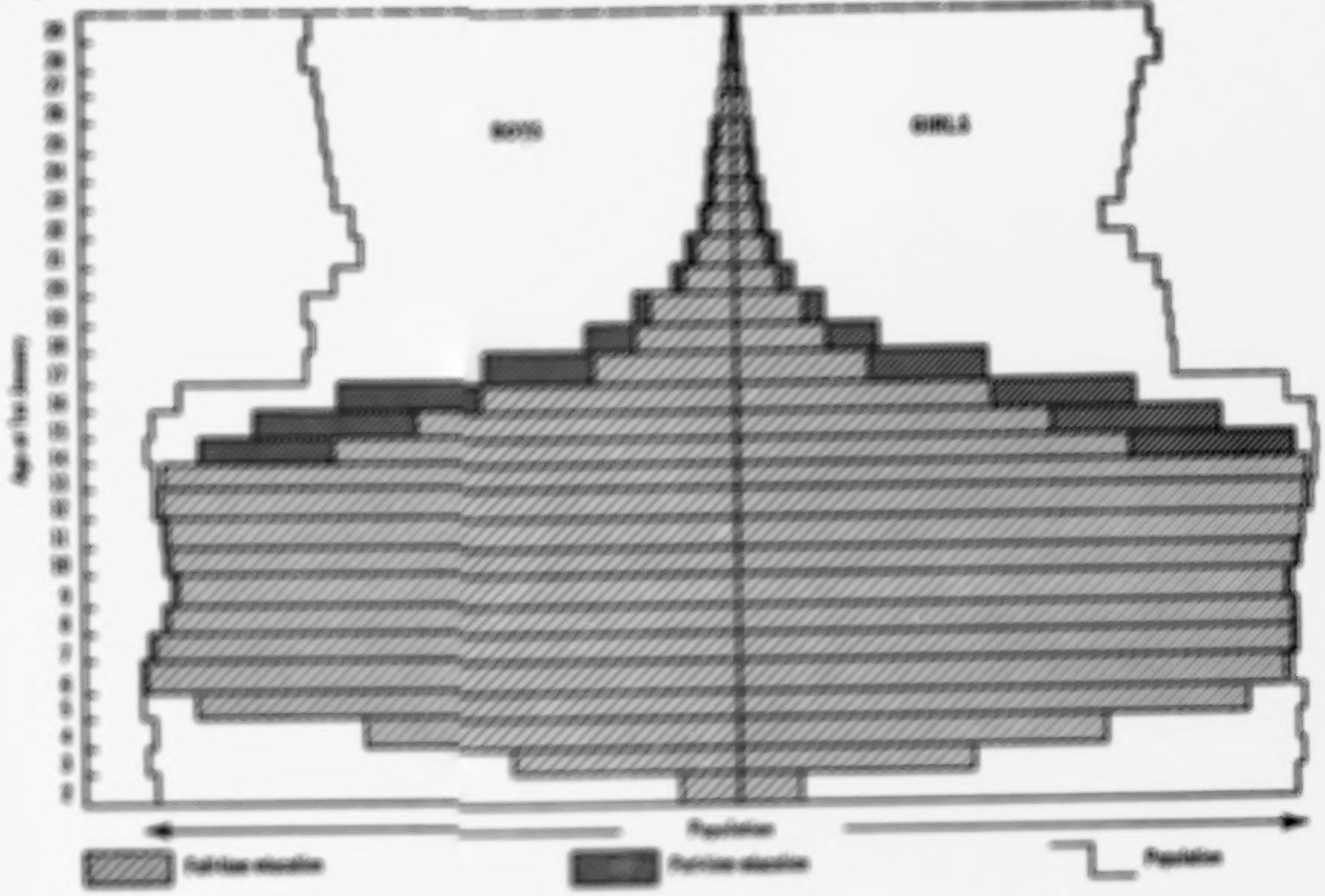
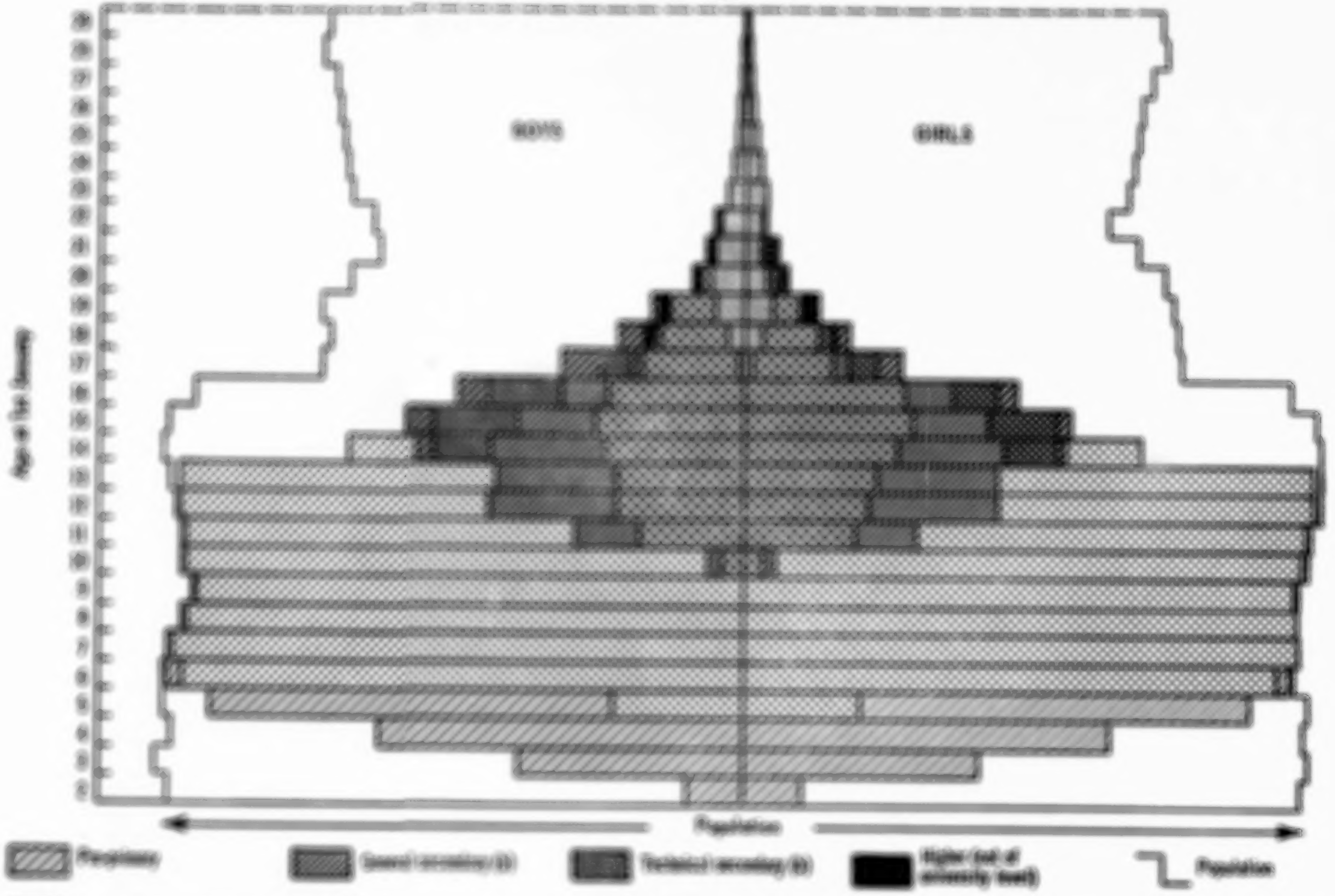


Diagram 3. EXAMPLE OF EDUCATIONAL PYRAMID AND ENROLMENT RATIOS BY TYPE OF EDUCATION
(full-time only)



cularly to vocational education and language teaching in many countries), in still other countries it merely means, usually for historical reasons, control by religious authorities instead of the State, with often very little difference between the two. In these circumstances the distinction between public and private institutions has little meaning for international comparisons. It is recommended, however, that special efforts be made to obtain data on private institutions, and where they are omitted this fact should be clearly noted. Many types of data are often available only for institutions over which the State has some measure of control. This often results in misleading international comparisons, when figures from the public sector only are compared with figures of the total educational system, or where figures for a country in which the public sector provides a large proportion of the total are compared with countries where the private sector is much more important. As explained in earlier chapters, it is vitally necessary for planning to have data on all types of institution, whether or not it is intended to plan them. In the case of international comparisons, a global comparison that omits data from any important type of institution in any country is valueless. It is largely immaterial which institutions are considered public and which private, so long as data on all are available.

The Classification of Education for International Comparisons

387. Bearing in mind what has been said earlier in this chapter on the differences in the structures of educational systems in different countries, it is nevertheless necessary to draw up a classification scheme that permits the largest possible measure of comparability of the various aspects of the educational systems.

388. In order to establish such a standardized statistical framework for international comparisons it is important to determine which features are common to the various educational systems under consideration. Work aimed at ascertaining the common features of different educational systems has been proceeding for several years in a number of contexts. Most well known is the work of UNESCO resulting in the 1961 Manual of Educational Statistics[1] in which a three tier system of classification into first level, second level and third level is proposed. Other work has been undertaken by the Council of Europe to establish a classification of School Systems of European countries[2]. Diagram 2 shows the major categories of education suggested by these two Organisations and relates them to the framework proposed for statistical tabulations in the present chapter.

389. The classification proposed here resembles in some ways the other two, but differs from them at a number of points.

1. *Common features of the Classifications*

a) The fundamental levels or stages of education are the same in all three cases and the same terminology is used to define their components.

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[1] *Manual of Educational Statistics* (UNESCO - Paris 1961).

[2] *School Systems - A Guide* (Council for Cultural Co-operation, Council of Europe - Strasbourg 1965).

DIAGRAM 1. SYSTEMS OF CLASSIFICATION OF EDUCATION
COMPARISON BETWEEN THE OECD, UNESCO, AND COUNCIL OF EUROPE PROJECTS

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT		UNITED NATIONS EDUCATIONAL, SCIENTIFIC AND CULTURAL ORGANISATION		COUNCIL OF EUROPE	
	Level, Grade and Type of Education	*Level and Type of Education*		*Stage of Education and Type of Institution*	
Higher	Education in Universities and Equivalent Degree-granting Institutions: a) Courses leading to qualifications below the level of a first degree b) First-degree level c) Postgraduate courses Other Higher Education	IIIrd Level	Universities and Equivalent Institutions leading to a degree Teacher Education at Non-university Institutions Other Education at Non-university Institutions	Stage VI	Post-Graduate Study
				Stage V	Specialised Vocational Schools Higher Stage of University Study
				Stage IV	Advanced Technical Schools Lower Stage of University Study Teacher Training
Primary and Secondary	grade 12 grade 11 grade 10 grade 9 grade 8 grade 7 grade 6 grade 5 grade 4 grade 3 grade 2 grade 1 *Secondary* — all grades general or technical. Further distinction by orientation of pupil. Pupil is either enrolled in institution from which there is a high probability of continuing to higher education, or not. *Primary* — all grades general education	IInd Level	General Education Vocational Education Teacher Training	Stage III	Full-time and Part-time Vocational Schools Upper Section of Grammar Schools (Gymnasia, Lycées, etc.) Teacher Training
				Stage II	Upper section of Elementary Schools Lower Section of Grammar Schools (Gymnasia, Lycées, etc.) Secondary Modern Schools Intermediate Schools
		Ist Level	Primary, Elementary Education	Stage I	Primary Schools
	Pre-Primary	*Preceding 1st Level*		*Pre-School Education and Kindergarten*	

SOURCE: Manual of Educational Statistics, UNESCO, 1961.
Education in Europe, School Systems, "A guide," Council for Cultural Co-operation of the Council of Europe, Strasbourg, 1965.

b) The following correspondence exists between the levels of education in the three cases.

Pre-primary (OECD) = Preceding First Level (Unesco)
= Pre-school Education and Kindergarten (Council of Europe).
Primary and = First and Second Levels (UNESCO)
Secondary (OECD) = First, Second and Third Stages (Council of Europe).
Higher (OECD) = Third Level (UNESCO)
= Fourth, Fifth and Sixth Stages (Council of Europe).

c) In no case is primary education broken down by type. It is considered to be general education in all the classifications.

2. *Difference between the Classification*

300. The differences occur when the levels of education are broken down into smaller units, and different types of education are distinguished.

301. *As far as primary and secondary education* are concerned, the Council of Europe classifies types of schools by stage of education. UNESCO considers primary and secondary education as two different levels, the former being broken down by type. For international comparisons, the best solution seems to be not to distinguish between primary and secondary education, and to *show* grades from 1 to 12 or 13 continuously, from the start of primary till the completion of secondary education. The main reasons are summarised below.

1. The lengths of primary and secondary education vary widely from country to country. Clearly it is not very meaningful to compare enrolments in countries where primary education lasts 4 years with enrolments in countries where this education lasts 8 or 9 years.
2. Many countries have a system where some primary and secondary education overlap. Counting grades continuously makes it easier to take into account such cases. There are, in some countries « complementary courses » following the normal primary education course. These courses generally last until the completion of compulsory schooling, and are often considered to be prolonged primary education. In the tabulation scheme proposed here these grades would be considered as following on in numerical order those primary grades that have already been completed. They will be considered as a different orientation, rather than a different level, from the secondary courses being taken by other pupils.
3. It has always been a problem to compare countries where comprehensive education is common with those where levels of education are clearly defined. With few exceptions, both comprehensive education, and education structured by level can be divided up by grade. In many European countries the trend is toward comprehensive education, and this must be kept in mind.
4. By collecting statistics by grade, any regrouping that is wished for special studies can be made. Instead of relying on very different lengths of « primary » and « secondary » education, it

statistics were available, by grade for each country, they could be grouped and aggregated to cover the same time period. This would permit grouping of grades 6-7-8, [illegible], etc. This introduces a measure of flexibility that cannot be had from a classification by level alone.

b. UNESCO breaks secondary education down into general education, vocational education and Teacher Training. The Council of Europe classifies different types of schools into two stages of education at the secondary level. The distinction between general and technical, vocational education has been maintained in the present recommendations, but these two major types are further broken down to take into account in very aggregate terms comparative educational opportunity. The breakdown consists in classifying pupils by the 'type of institution'[1] in which they are enrolled.

Type *a)* Pupils enrolled in technical and vocational or general education from which the probability of continuing to higher education is relatively high. All pupils in comprehensive schools will normally come within this category unless *a)* and *b)* streams as defined here can be clearly distinguished within the institution.

Type *b)* Pupils enrolled in technical and vocational, or general education from which the probability of continuing to higher education is not high. This is the category in which most vocational secondary education will be classified.

302. Pupils receiving education of type *b)* are more likely to leave the educational system on the completion of compulsory schooling, or after having obtained a specific vocational qualification. The distinction made by the Council of Europe between the lower and upper sections of secondary schools, which is of interest for comparisons, can be very easily made with data by grade, when the starting and finishing points of the stages are known.

303. As far as *higher education* is concerned, the three classifications make a distinction between university and other higher education. Further breakdown shows differences between the three classifications.

a. For university and equivalent education, the classification, in all three cases is a classification of institutions and not strictly type of education. UNESCO does not go into the different stages of education discernible within university and equivalent education. To a certain extent, the Council of Europe does make these distinctions, but not as a function of the kind or level of qualification to which education leads. For international comparisons it seems desirable to classify the courses taken in university and equivalent institutions as:

i) Courses leading to a qualification not of the standard of a first degree.

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[1] In some circumstances this distinction may be used to describe different «streams» within the same institution.

- (i) Courses leading to qualifications of a first degree or equivalent. (Examples, Licence in France and Belgium, B.A., B.Sc. in the United Kingdom, United States, Japan, Doctorate in certain faculties of Germany and Switzerland, Kandidat in Norway and Sweden, Laurea in Italy). In addition, amongst recognised equivalents of a university degree are many engineering and technical awards from specialised schools.
- (ii) Courses leading to qualifications higher than a first degree, referred to here after as post-graduate education.

2. Apart from universities and equivalent institutions, and extended secondary education, the proposed classification and that of UNESCO make provision for education in other higher institutions, not of degree-level. (e.g. Junior colleges in the United States, Teacher Training Colleges in the United Kingdom, specialist technical schools, etc.).

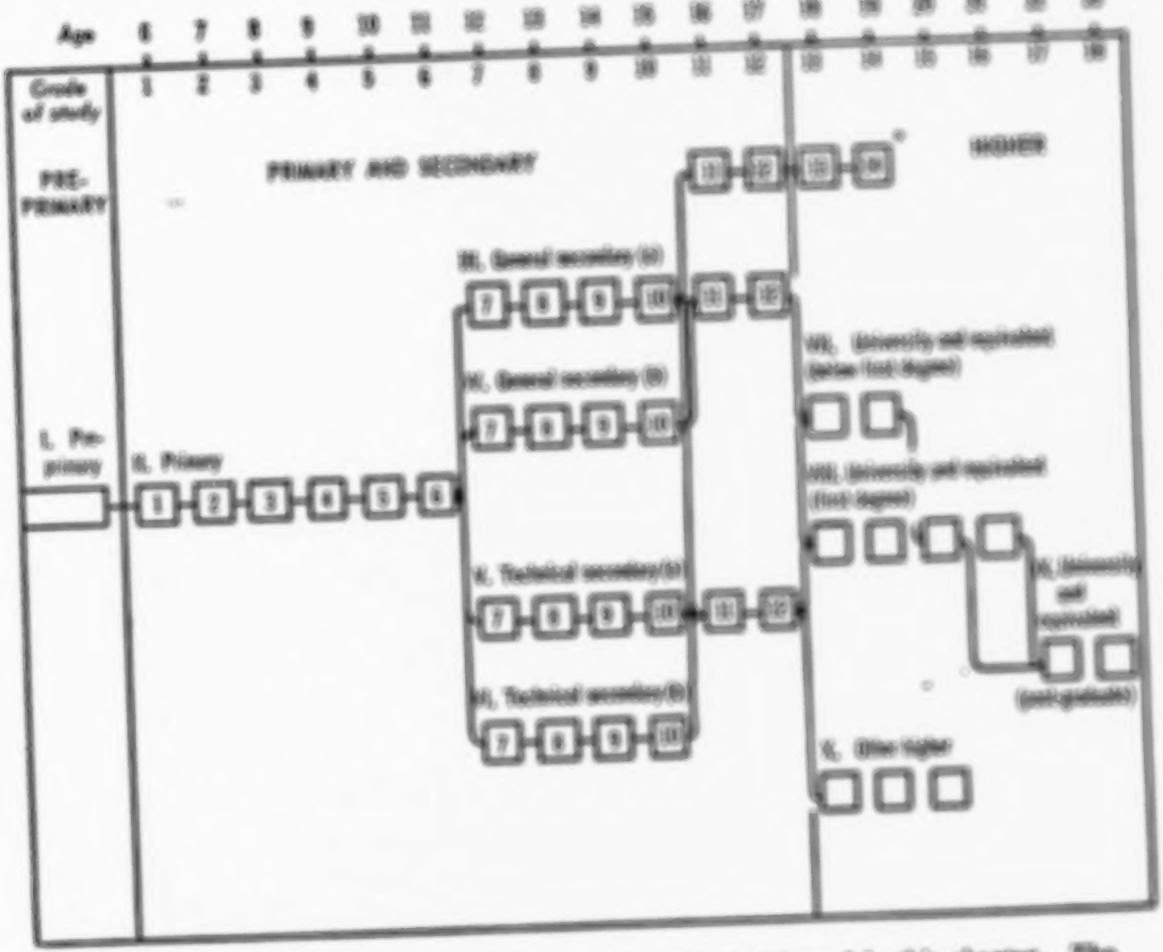
304. There is one type of education that presents difficulties for classification by level. This is education that overlaps both secondary and higher education as these two levels are normally understood. The ideal solution would be to consider those students enrolled in grades normally corresponding to grades of the secondary level as following secondary education, and those enrolled in grades corresponding to higher education as being enrolled in higher education. Information may not always be available to make a clear-cut distinction of this kind, so that countries will have to decide each particular case as it arises.

ENROLMENT AT ALL LEVELS OF EDUCATION BY AGE, GRADE AND TYPE

305. The data from table A will make the construction of comparative educational pyramids, and the calculation of enrolment ratios possible. The enrolment ratios can be calculated for individual grades, or for different groupings of pupils for a comparative study of the orientation of pupils towards different types of education. It is hoped that the grade breakdown will bring out structural differences that are hidden by level comparisons. For example studies of the comparative rates of progress of pupils can be approached in two ways:

1. By selecting a particular age and studying the distribution by grade and type, it can be seen that a certain percentage are in the grade which corresponds to that age, some below and some above.
2. By selecting a given grade and studying the distribution of pupils by age, once again retardation and acceleration can be studied. In OECD countries grade 1 of primary education is entered at different ages. For example, in the United Kingdom this normally takes place at age 5, and in Sweden at age 7. After 8 years of education, these pupils should be respectively aged 13 and 15 and in grade 8 of their school systems. Differences of this kind and their pedagogical implications could form the basis of comparative studies that might help in making national decisions about the age limits of compulsory schooling, for example.

Diagram 4. AN ILLUSTRATION OF THE CLASSIFICATION SCHEME PROPOSED IN CHAPTER IX FOR INTERNATIONALLY COMPARABLE STATISTICS


Age
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
Grade of study
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
PRE-PRIMARY
PRIMARY AND SECONDARY
HIGHER
I. Pre-primary
II. Primary
III. General secondary (a)
IV. General secondary (b)
V. Technical secondary (a)
VI. Technical secondary (b)
VII. University and equivalent (below first degree)
VIII. University and equivalent (first degree)
IX. University and equivalent
(post-graduate)
X. Other higher
*

This diagram summarises the basic classification model used in this chapter. The number of grades in each branch of education must be adapted according to national conditions. For descriptions of the different branches of education distinguished, see text. The classification scheme is intended to permit the incorporation of the major features of the various educational systems of OECD countries and the educational statistics of each country regrouped in this form will form the basis for international comparisons.

Age is shown only as an indication of the age at which pupils who are neither accelerated or retarded might be in a typical system. It is realised that pupils of different ages will be enrolled in the same grade in all countries.

* Illustration of Courses beginning before completion of secondary education, and terminating after normal completion of secondary education. See para. 394.

With these data, not only enrolment ratios by grade can be calculated, but median and average ages for grades in countries also. The median and average grade completed by pupils of certain ages in various systems can also be compared.

Field of Study

396. Having classified and defined the different levels of education and types of institution, there is one further important way of subdividing some

TABLE A. ENROLMENT[1] AT ALL LEVELS OF EDUCATION, BY AGE, GRADE AND TYPE

AGE OF ENROLLED PERSONS → LEVEL, GRADE AND TYPE OF EDUCATION[2] ↓		under 5 years	5 years	6 years	7 years	8 years	9 years	10 years	11 years	12 years	13 years	14 years	15 years	16 years	17 years	18 years	19 years	20 years	21 years	22 years	23 years	24 years	25 years	26 years	27 years	28 years	29 years	30 years	over 30 years	TOTAL
Pre-Primary																														
Primary Education :	Primary and Secondary																													
grade 1																														
grade 2																														
grade 3																														
grade 4																														
grade 5																														
etc.																														
Secondary Education :																														
i) general type (*a*) :																														
grade 6																														
grade 7																														
grade 8																														
grade 9																														
grade 10																														
grade 11																														
grade 12																														
etc.																														
ii) general type (*b*) :																														
grade 6																														
grade 7																														
grade 8																														
grade 9																														
grade 10																														
grade 11																														
grade 12																														
etc.																														

TABLE A (Cont'd). ENROLMENT AT ALL LEVELS OF EDUCATION, BY AGE, GRADE AND TYPE

AGE OF ENROLLED STUDENTS → LEVEL, GRADE AND TYPE OF EDUCATION ↓		under 5 years	5 years	6 years	7 years	8 years	9 years	10 years	11 years	12 years	13 years	14 years	15 years	16 years	17 years	18 years	19 years	20 years	21 years	22 years	23 years	24 years	25 years	26 years	27 years	28 years	29 years	30 years	over 30 years	Total
iii) technical type (a):	Primary and Secondary																													
grade 6																														
grade 7																														
grade 8																														
grade 9																														
grade 10																														
grade 11																														
grade 12																														
etc.																														
iv) technical type (b):																														
grade 6																														
grade 7																														
grade 8																														
grade 9																														
grade 10																														
grade 11																														
grade 12																														
etc.																														
Higher Education:																														
i) Education in University and Equivalent Degree-Granting Institutions:																														
Pure Sciences																														
Architecture																														
Technology																														
Medical Science																														
Agriculture																														
Humanities																														
Law																														
Social Sciences																														
Fine Arts																														

Architecture																													
Technology																													
Medical Science																													
Agriculture																													
Humanities																													
Law																													
Social Sciences																													
Fine Arts																													
Education																													
Others, Miscellaneous																													
Other Education (n.e.c.)																													
a) Total = Persons Enrolled by Age																													
b) Total = Total Population by Age																													
Enrolment Ratio = $\frac{a}{b}$																													

1. Show full-time and part-time enrolment separately.
2. For description of classification, see text.

Discontinuous lines are shown to indicate that countries should emphasize the age during which schooling is compulsory. The lines will vary from country to country.

CLASSIFICATION BY FIELD OF STUDY OF TECHNICAL SECONDARY EDUCATION

Draughtsmanship Engineering (all fields) Merchant Marine Engineering Radio Communication Operation etc.[1]	Science and Technology
Teacher training for : Physical education Pre-primary Primary Secondary Special (for handicapped children) etc.[1]	Teacher Training
Accountancy Bookkeeping Business and Administration Languages Secretarial Trade, banking, clerical etc.[1]	Commercial
Agriculture Dairying Forestry Fishing Horticulture etc.[1]	Agriculture and Fishing
Catering Childcare Cooking Domestic Science Hotel Management Housekeeping	Home Economics
Child Welfare Midwifery Nursing Social and Welfare Studies	Nursing and Para. Medical
Humanities Fine Arts Music etc.	General
Handicrafts etc.	Other

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[1] Other detailed specialisations which may be included in each major group are to be found in the proposed classification for higher education.

CLASSIFICATION OF FIELDS OF STUDY FOR HIGHER EDUCATION

Astronomy Bacteriology Biochemistry Biology Botany Chemistry Entomology Geology Geophysics Mathematics Meteorology Mineralogy Physics Zoology Others	Pure Sciences	Science and Technology
Architecture	Architecture	
Applied Sciences Construction Geodesy Metallurgy Mining Surveying Technology Textile Engineering Others	Technology	
Anatomy Dentistry Medicine Midwifery Nursing Optometry Osteopathy Pharmacy Physiotherapy Public Health Surgery Others	Medical Science	Medical Science
Agricultural biological Sciences Agricultural economics Agricultural physical Sciences Animal husbandry Crop husbandry Dairy farming Fisheries Food Technology Forestry Horticulture Veterinary Medicine Others	Agriculture	Agriculture

CLASSIFICATION OF FIELDS OF STUDY FOR HIGHER EDUCATION (Cont'd)

Archaeology	Humanities	Other
History		
Languages		
Library Science		
Literature		
Philosophy		
Psychology		
Theology		
Others		
Education	Education	
Pedagogy		
Physical Education		
Drawing	Fine Arts	
Music		
Painting		
Sculpture		
Speech and Dramatic Art		
Others		
Jurisprudence	Law	
Law		
Banking	Social Sciences	
Commerce		
Diplomacy		
Economics		
Ethnology		
Geography		
Home Economics		
International relations		
Journalism		
Political Science		
Public Administration		
Social Welfare		
Sociology		
Statistics		
Others		
Other and Miscellaneous	Other	

of the branches of education. This is in terms of the subject specialisation. This is a classification that cuts across the institutional breakdown since very often students specialise in different subject areas within the same institution. Classification by subject specialisation is clearly of particular importance in any tabulation of diplomas awarded. Specialisation usually starts within secondary education. In the present tabulations, classification by subject specialisation is proposed for higher education and technical secondary education. That for higher education is based closely on the UNESCO recommendations, but additional specialisations have been added to the detailed breakdown and some minor regrouping has been suggested for the aggregated groups. Where a student studies a combination of subjects he should be attributed to the group corresponding to the principal subject he is studying[1]. Subsidiary subjects are not treated in the present scheme.

197. In the case of technical secondary education, there is the difficulty that it covers a vast number of different course specializations in many countries. The detailed breakdown given here represents only a number of examples of the type of courses that would be included in each of the more aggregate groups. This is an area in which further work will be necessary in each country in the initial period of experimental data collection.

HIGHER EDUCATION

198. Comparative statistics of higher education are of particular interest to many OECD countries both from a manpower and from a more general social point of view. The principal points of interest are illustrated in Tables B and C. They show data on the number of students enrolled in each field of higher education, the number of new entrants and the number of graduates at different levels.

New Entrants

199. One subject of major interest in comparative education is the admissions procedure into higher education in different countries. For international comparisons the number of new entrants in itself is not of great interest (total enrolment by age in each type of institution and field of study having been shown in Table B). It is, however, extremely useful to be able to compare the routes by which pupils accede to higher education in different countries. An initial indication of this can be given by collecting comparative data on the immediately preceding activity of new entrants to higher education. This is proposed in Table B. In order to interpret these data analytically it will be necessary to compare the new entrants columns of Table B with the distribution of pupils in the different types of secondary education as shown in Table A. Some examples of the types of analysis this makes possible are shown below. In a country with a rigid system of access to higher education and in which selection for higher education effectively takes place at an early age, there will be pupils of ages approximately 12 to 17 in both (a) and (b) types of secondary institution. After the age of approximately 15, overall enrolment rates in general education will be rather low and pupils will be concentrated in type (a) institutions. In table B new entrants will be shown as coming predominantly from type (a) general institutions. In a rather more flexible system there will be new entrants from all types of secondary institutions and also from outside the educational system (if adults have the chance of entering higher education after some time in the labour force). In a comprehensive system of secondary education all pupils from about age 12 to about age 16 will be in type (c) secondary schools and enrolment rates will probably be relatively high. Many other different combinations of secondary education structure and ways of access to higher education can be conceived most of which could be analysed in terms of the information suggested in Tables A and B. Similar comparative analysis might be undertaken of the relationship between type of secondary education

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[1] See Annex VII for one country's treatment of this problem.

Table 8. EDUCATIONAL BACKGROUND AND ORIG
ENROLMENT AND GRADUATES

[illegible] TYPE OF INSTITUTION AND FIELD OF STUDY (1)	NEW ENTRANTS [illegible] ¹								
	SECONDARY EDUCATION					[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]		[illegible]		[illegible]				
	(a)	(b)	(a)	(b)					
I. UNIVERSITIES AND EQUIVALENT DEGREE-GRANTING INSTITUTIONS ²									
1. *Pure Sciences* :									
Astronomy									
Bacteriology									
Biochemistry									
Biology									
Botany									
Chemistry									
Entomology									
Geology									
Geophysics									
Mathematics									
Meteorology									
Mineralogy									
Physics									
Zoology									
Others									
2. *Architecture*									
3. *Technology*									
Applied Sciences									
Construction									
Geodesy									
Metallurgy									
Mining									
Surveying									
Technology									
Textile Engineering									
Others									
4. *Medical Sciences* :									
Anatomy									
Dentistry									
Medicine									
Midwifery									
Nursing									
Optometry									
Osteopathy									
Pharmacy									
Physiotherapy									
Public Health									
Surgery									
Others									

1. New entrants are persons enrolled in an institution of higher education for the first time.
2. See text for description of which students should be included in this category.

[illegible] NEW ENTRANTS TO HIGHER EDUCATION, TOTAL
[illegible] OF COURSE AND QUALIFICATION

[illegible]				[illegible]				[illegible]			
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Continued page [illegible], [illegible] →

Table 8 (Cont'd). EDUCATIONAL BACKGROUND A
TOTAL ENROLMENT AND GRADUATES

[illegible]	[illegible] 1									
	FULL-TIME EDUCATION					[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]		[illegible]		[illegible]				
[illegible]	(M)	(F)	(M)	(F)					
5. *Agriculture* :									
Agricultural economics									
Animal husbandry									
Crop husbandry									
Dairy farming									
Fisheries									
Food Technology									
Forestry									
Horticulture									
Soil and Water Sciences									
Veterinary medicine									
Others									
6. *Humanities* :									
Archeology									
History									
Languages									
Library Science									
Literature									
Philosophy									
Psychology									
Theology									
Others									
7. *Fine Arts* :									
Drawing									
Music									
Painting									
Sculpture									
Speech and dramatic art									
Others									
8. *Education* :									
Education									
Pedagogy									
Physical education									
9. *Law*									
10. *Social Sciences* :									
Banking									
Commerce									
Diplomacy									
Economics									
Ethnology									
Geography									
Home Economics									

1. New entrants are persons enrolled in an institution of higher education for the first time.
2. See text for discussion of which students should be included in this category.

ICIN OF NEW ENTRANTS¹ INTO HIGHER EDUCATION,
PE OF COURSE AND QUALIFICATION

DENTS ENROLLED IN DEGREE COURSES				OTHER STUDENTS²				GRADUATES			
[illegible]	[illegible]	[illegible]	TOTAL	[illegible]	[illegible]	[illegible]	TOTAL	[illegible]	[illegible]	[illegible]	TOTAL

Continued pages 202, 203 →

TABLE B (*Cont'd*). EDUCATIONAL BACKGROUND A
TOTAL ENROLMENT AND GRADUATES

ENROLLED STUDENTS → TYPE OF INSTITUTION AND FIELD OF STUDY ↓	NEW ENTRANTS COMING FROM :								TOTAL
	FULL-TIME EDUCATION					PART-TIME EDUCATION	OUTSIDE EDUCATIONAL SECTOR	ABROAD	
	GENERAL SECONDARY		TECHNICAL SECONDARY		OTHER EDUCATION				
	(*a*)	(*b*)	(*a*)	(*b*)					
International Relations.									
Journalism									
Political Science									
Public Administration .									
Social Welfare........									
Sociology									
Statistics									
Others...............									
11. *Others* (*n. e. c.*)									
Total universities and equivalent.........									
II. OTHER INSTITUTIONS OF HIGHER EDUCATION : (same breakdown as above)									
Total									

1. New entrants are persons enrolled in an institution of higher education for the first time.
2. See text for discussion of which students should be included in this category.

4

IGIN OF NEW ENTRANTS[1] INTO HIGHER EDUCATION,
PE OF COURSE AND QUALIFICATION

UDENTS ENROLLED IN REGULAR COURSES				OTHER STUDENTS[2]				GRADUATES			
FIRST DEGREE LEVEL	COURSES LEADING TO FIRST DEGREES	POST GRADUATE COURSES	TOTAL	COURSES BELOW FIRST DEGREE	COURSES LEADING TO FIRST DEGREE	POST-GRADUATE COURSES	TOTAL	QUALIFICA-TIONS BELOW LEVEL OF FIRST DEGREE	FIRST DEGREE OR EQUIVALENT	POST GRADUATE QUALIFICA-TIONS	TOTAL

and specialisation by subject in higher education. Of course, a highly sophisticated analysis of these questions would require much more specific studies in the countries to be compared. As with all international data the present tables provide a meaningful starting point and would help to ensure that specific studies asked the right questions. The term new entrants should refer to persons who are enrolled in institutions of higher education, for the first time. Only those enrolled in regular courses for a substantial part of the academic year at institutions should be shown. No distinction should be made between full-time and part-time students which is an exceptionally difficult distinction for comparative statistics of higher education. There is further discussion of this point in the following paragraph.

ENROLMENT

400. No justification is needed to the attempt to collect figures of total enrolment. However sophisticated the analysis, whatever subsidiary data are required, the basic educational statistics for almost any purpose are those of numbers of students enrolled. In the case of students attending courses of first degree level and below, the term enrolled students should be taken to refer to all students, full-time and part-time who are enrolled to attend courses regularly at an institution of higher education. Students who are not enrolled to attend regular courses at an institution of higher education (correspondence courses, university of the air, private study, etc.) should be *recorded separately* where they are enrolled as preparing for a particular qualification, and where reliable figures are available. In the case of students enrolled in courses of post graduate level, the fulfilment of the formal conditions laid down nationally in order to prepare for a higher degree is sufficient for inclusion in the total of enrolled students.

401. Since the term institutions of higher education as used in the present proposals refers to establishments offering a rather wide range of courses at different levels, a distinction is proposed between courses leading to qualifications below the level of a first degree courses and courses enrolling students preparing for a qualification higher than a first degree.

402. The criterion for distinguishing students preparing for a post-graduate degree level, is that they must already hold a full first degree as it is normally understood according to national definitions.

GRADUATES

403. The term graduates refers to all persons obtaining a qualification of the level mentioned, in the year referred to in the table. Where a distinction can be made to correspond to enrolled students and students who prepared for the qualification without regularly attending institutions of higher education, this distinction should be made. Otherwise, all students obtaining a qualification at the relevant level should be included.

DURATION OF COURSES AND WASTAGE FROM HIGHER EDUCATION

404. One type of comparison in higher education that interests very many countries is the efficiency of their institutions as compared with those

of other countries. This is clearly a subject even more than many others that needs detailed studies rather than aggregate statistics. Table C is suggested as a preliminary basis for such detailed studies. In its present form it refers only to first degree courses. Even this table will present considerable difficulties to most countries at present but could be readily completed if a cohort analysis of the type proposed in table 8 of chapter VII were available. In the absence of such an analysis it is anticipated that most countries will be able to provide information on the prescribed length of first degree courses[1]. It is hoped that some countries will be able to provide data on average and median length of studies of students who do finally successfully complete the course. If the average and median measures of the mean are both provided this will give some idea of the shape of the distribution and therefore some indication of whether a large number of students require more than the prescribed time to complete the course or whether most students complete the course in the prescribed time but a few take considerably longer.

405. An indication of wastage would be given by the column showing number of enrolled students who left the course between the beginning of one academic year and the next without obtaining a degree. This should refer only to enrolled students, full-time or part-time who were attending regular courses as defined in the previous table. This measure would give only a very crude comparative measure of wastage but even this comparison cannot be made at present. More sophisticated analysis showing average length of studies of students who drop out must wait upon the further development of national planning statistics.

TABLE C. COMPARATIVE DURATION OF STUDY OF COURSES LEADING TO A FIRST DEGREE, BY FIELD OF STUDY

DURATION OF STUDY → FIELD OF STUDY ↓	PRESCRIBED DURATION OF STUDIES	AVERAGE DURATION OF STUDIES	MEDIAN DURATION OF STUDIES	PERCENTAGE OF TOTAL STUDENTS LEAVING THE COURSE DURING THE PRECEDING YEAR WHO DID NOT OBTAIN A DEGREE
Field of Study :				
Pure Sciences				
Architecture				
Technology				
Medical Science				
Agriculture				
Humanities................				
Fine Arts				
Education				
Law				
Social Sciences				
Other				

NOTE. This information should be compiled for qualifications of the level of a first degree or equivalent. If there are particular subjects that have a prescribed duration that differs greatly from that for other subjects in the group, this should be specified separately.

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[1] Since the aggregated subject classification is proposed, this will often be a range since not all courses are the same length. This problem would arise even if a more detailed breakdown were proposed since courses even in particular subjects may be of different lengths in different institutions.

Table D (*i*). NON-NATIONAL STUDENTS FOLLOWING FI
TO NON-NATIONALS

FIELD OF STUDY → COUNTRY OF STUDY ↓	PURE SCIENCES		ARCHITECTURE		TECHNOLOGY		MEDICAL SCIENCES		AGRICULT	
	S	G	S	G	S	G	S	G	S	
Aden...........										
Albania.........										
Algeria										
Angola										
Argentina										
Australia										
Austria										
etc.										

S = Students.
G = Graduates.
Table D (*ii*). Similar for Post-graduate students.
Table D (*iii*). Similar for Students following courses leading to a qualification below First Degree Level.

Foreign Students in Higher Education

406. One further characteristic of some of the pupils in higher education does need some special attention in an international context. This is the geographic origin of students who are not nationals of the country in which they are students. These data are valuable for a number of reasons[1].

i) International flows of students are an important factor in the analysis of the migration of highly qualified manpower.

ii) Since many students from abroad are from developing countries, and since these countries do not always have adequate statistics on the number of their nationals studying abroad and what they are studying, and since a large proportion of students from developing countries are in universities in OECD countries, these countries have a special obligation to provide data on their numbers for the benefit of educational planners in developing nations.

iii) Since many of these students are subsidised in one way or another by the host country, a case can be made for taking this into account in assessing the foreign aid efforts of the advanced countries.

407. Table D proposes therefore to collect data on the total enrolment of non-nationals in higher education, the number of graduates by country of origin and major field of study. Table D (*i*), as illustrated, refers simply to students attending courses of first degree level and obtaining first degree qualifications. A simple table should be prepared for students and qualifications beyond the first degree level and where possible, for students attending higher education courses leading to qualifications below first degree level.

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[1] From the point of view of the national educational planning of the host country, it is of course necessary to have data on the total number of foreign students, in order to allow for inflows into higher education (and other branches), not originating from another branch of the national educational system.

GREE COURSES AND NUMBER OF FIRST DEGREES AWARDED
JOR FIELD OF STUDY

MANITIES		FINE ARTS		EDUCATION		LAW		SOCIAL SCIENCES		OTHERS	
	G	S	G	S	G	S	G	S	G	S	G

408. As with many of the concepts proposed in this chapter, the concept of a student from abroad presents some difficulty in marginal cases. (Students who have obtained their secondary education in the host country, children of settlers from the host country, who may remain nationals of their country of origin while residing elsewhere, etc.). In the UNESCO Surveys of Study Abroad[1] no standardised definition is proposed, but in the national returns to the UNESCO questionnaire most countries adopt the criterion of nationality and include all students who are not nationals of the host country. This criterion is proposed in the present context.

QUALIFICATIONS AWARDED ON THE COMPLETION OF SECONDARY EDUCATION

409. Many countries are interested in comparing qualifications awarded. In many ways, this is the best indication of output of the educational system, and thus gives a good measure of relative performance of educational systems.

410. Some stages of education are more interesting and more comparable internationally than others. Qualifications awarded on the completion of secondary education, and the obtention of a first university or equivalent degree are two such critical points for comparisons. Information on higher education has been asked for in Table B. In Table E the number of persons obtaining the secondary leaving qualification is asked for. By secondary leaving qualification is meant that qualification that is usually demanded as a condition for entry to higher education. In many cases this will be the only required condition, in others, further tests and competitive examinations will be necessary before students actually enter higher education. These competitive examinations are not included in the present table.

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[1] *Study Abroad*, an annual series (UNESCO, Paris).

In some systems there may not be a specific national examination or qualification that is recognised as being a ticket to university entrance. In such countries, all persons completing the final grade of secondary education, and entitled as a result, to proceed to higher education should be included in this table.

411. If the qualification is obtained by passing an examination, the numbers entering, as well as the successful candidates should be given. This will permit a comparison of success and failure and indicate the extent to which the final secondary school examination is the crucial hurdle to university entrance.

412. In some countries specialisation takes place at an early stage of education. In such case the links between school orientation, and field of study in higher education are likely to be close. To study and compare this factor, it is proposed that where relevant, some idea of the orientation of pupils leaving secondary education be given. Thus, all candidates should be categorised by the orientation of their study. According to the subjects taken in the examination, pupils should be listed as taking :

Scientific Subjects	(Mathematics, physics, chemistry, etc.)
Technical Subjects	(Technical drawing, industrial design, technology, etc.)
Social Science Subjects	(Economics, commerce, geography, etc.)
Other Subjects	(Languages, literature, history, etc.).

Table E. QUALIFICATION AWARDED ON THE COMPLETION OF SECONDARY EDUCATION

ORIENTATION OF STUDY → PUPILS ↓	SCIENTIFIC SUBJECTS	TECHNICAL SUBJECTS	SOCIAL SCIENCES SUBJECTS	OTHER SUBJECTS	TOTAL
Entering......................					
Successful					

STUDENTS IN HIGHER EDUCATION BY SOCIO-ECONOMIC BACKGROUND

413. International comparisons of socio-economic characteristics of pupils, and how they affect their educational careers are very desirable, but very difficult to make. The main reason for this is that very few data on the subject are available, and that it is not easy to interpret them on an international basis. Nevertheless a start should be made, and in Table F it is proposed that data on the parental occupation of students in universities and equivalent institutions be compared. At a future date it is hoped that far more detailed studies will be made especially at critical transition points. At present it is proposed that a start be made with higher education, thus permitting a comparison of the eventual outcome of the sociological selection processes in all branches of education. This table would compare the

percentage of students in each group with the weight of that group in the total population. Comparisons will be made of the difference in the representation of each group in higher education.

414. Total population has been chosen for comparisons of the proportion of each socio-economic group in higher education. In fact, this is not the exact base group to which such data should refer. The base group should be constituted by cohorts of pupils who enter primary education in the same year. As it will be a long time before full cohort analyses become available, the population will have to serve as a substitute till then. Even so, the base group can be better estimated by taking the socio-economic composition of the population aged 40 and above, as these are the people who are likely to have children of university-going age.

TABLE F. STUDENTS IN UNIVERSITIES AND EQUIVALENT INSTITUTIONS BY SOCIO-ECONOMIC BACKGROUND

OCCUPATION OF HEAD OF FAMILY	STUDENTS ENROLLED *Per cent*	TOTAL POPULATION[1] *Per cent*
I. Professional, Technical and Related Workers		
II. Administrative Executive and Managerial Workers		
— Government		
— Other		
III. Clerical and Sales Workers		
— Working Proprietors		
— Others		
IV. Agricultural Workers		
— Farmers, Farm Managers		
— Others		
V. Manual Workers		
— Skilled		
— Semi-skilled		
— Unskilled		
VI. Service Workers		
VII. Others and not specified		
Total	100.0	100.0

[1] If information is available for population aged 40 and above, show it in a separate column. (For details of classification of occupation of head of family, see Table 11, chapter VII.)

COMPARATIVE TEACHER STATISTICS

415. It is difficult to collect meaningful teacher statistics on a national level, far more so to try to make valid international comparisons.

416. In the chapter concerning the tabulation scheme for national planning, many of the difficulties of collecting statistics on teachers have been discussed. This discussion led to the conclusion that the best way to surmount these difficulties was to collect data on teachers by type of institution in which they teach, disaggregated to show the number of hours taught in a typical working period, and the subjects taught during those hours. A tentative method for collecting such data was suggested (see chapter VII, table 15). If all these data were available, the preparation of

comparative tables would become a matter of regrouping the data into a common framework. Unfortunately, it is likely that a long time will elapse before many countries will be in the position to make such data available. With this in mind, it is not suggested here that all data that would be interesting for comparisons are immediately collected. It is felt that, in the first instance, it will be preferable to have fewer data, than to go ahead and suggest complicated comparisons that would require vast amounts of work by national authorities and then would be incomplete and misleading.

417. The only table proposed covering primary and secondary education is very simply a stock table showing all teachers by type of institution in which they teach, by sex. They will not be distinguished by number of hours or subjects taught.

418. Special attention has been drawn to the fact that double-counting is hard to avoid. It is important to distinguish teachers by the type of education in which they teach, but many of them teach in more than one type of education. For this reason teachers are divided into 2 groups, those who teach in one type of institution only, and those who teach in more than one. Another distinction within each of these two groups, is whether teachers are « full-time » or « part-time. » The criterion for deciding

TABLE G. TEACHERS BY TYPE OF INSTITUTION IN WHICH THEY TEACH

CATEGORY OF TEACHER → TYPE OF INSTITUTION ↓	I FULL-TIME TEACHERS	II PART-TIME TEACHERS	TOTAL ALL TEACHERS
TEACHERS IN ONE TYPE OF INSTITUTION ONLY :			
Pre-primary			
Secondary :			
general type (*a*)			
general type (*b*)			
technical type (*a*)			
technical type (*b*)			
Higher :			
Extended secondary :			
Universities and equivalent degree granting institutions			
Education in other higher institutions			
TEACHERS IN MORE THAN OF ONE TYPE OF INSTITUTION :			
Pre-primary and primary			
Primary and general secondary (*a*)			
General secondary (*a*) and (*b*)			
Technical secondary (*a*) and (*b*)			
General and technical secondary			
Secondary and extended secondary			
Other combinations			
OTHER TEACHERS :			
Miscellaneous			
Total			

which are full, and which are part time must be left to individual countries. This is not an entirely satisfactory procedure, but until data on number of hours are available, no better solution can be suggested.

419. Although education of type *a*) and type *b*) may be differentiated by institution, in some cases both types will be available in the same institution. If it is difficult to distinguish teachers in such institutions by the type of education in which they teach, type *a*) and type *b*) should be shown together.

420. Although comparisons of teachers by hours they teach and subjects to which these hours are devoted, in relation to pupils' curricula are not suggested at this stage of the development of educational statistics, it must be kept in mind that this is one of the goals towards which comparative educational statistics should move in the future.

STAFF OF INSTITUTIONS OF HIGHER EDUCATION

421. Tables H and I suggest a means for tabulating comparative data on the staffs of institutions of higher education. A great deal of interest is shown by member countries of the OECD in this topic, though many difficulties have to be faced before reliable data become available.

422. In the text accompanying table 16 of the national tabulation scheme, the special problems concerning teacher statistics in higher education were mentioned. The conclusion reached was that data should be collected not only on numbers of persons working in institutions of higher education, but also on the way time is allocated between teaching, research, administration and other activities of academic staff.

423. Keeping in mind the problems raised in Table 16 of chapter VII it is suggested that the number of persons employed in institutions of higher education be shown in Table H. This table shows the specialisation and status of academic staff, and the number of supporting, non-academic staff in all institutions of higher education. For international comparisons the information should be shown for :

a) Universities and Equivalent Degree-Granting Institutions.
b) Other Institutions of Higher Education.

Academic staff are classified into three status groups, showing their rank[1].

a) Senior Academic Staff (full Professors, Heads of Departments, etc.).
b) Middle-level Academic Staff (associate professors, senior lecturers, etc.).
c) Junior-level Academic Staff (assistant lecturers, assistant professors, etc.).

424. As « teaching » is the activity that primarily concerns educational planners, even when the full analysis of allocation of academic staffs' time is not yet available, some idea is required of the number of persons having no teaching responsibilities at all. For this reason, for each field of specia-

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[1] Cf. *Structure of University Staff*, Council of Europe, Strasbourg, 1966.

lisation and status, the number of persons doing no teaching is asked for. This is rather interesting for comparisons, as in some countries it is common for a certain amount of industrial and other research to be contracted out to universities and other higher institutions. In such cases, many staff members may hold research appointments only.

425. For such factors to be treated more fully, table I sets out a scheme for analysing the allocation of academic staffs' time between teaching, research, administration, etc.

426. It is a derivative of table 17 of chapter VII. Since the length of university terms and vacations differ between countries the table is shown in terms of number of hours per year devoted to each major type of activity. Where information is available only on the allocation of university staff's time during term time, this fact should be indicated. The table should refer to the allocation of time of all academic staff shown in Table H. The term « teaching » should be restricted to activities indertaken when the staff member is in the presence of one or more students.

427. For definition of what is to be included under « lectures, » « seminars » and « practicals, » reference should be made to Appendix A of the questionnaire used by the Robbins Committee, attached to the text of table 16[1]. Using this appendix, it is suggested that

a) *Lectures* should cover the items « lecture » and « extra-curricula lecture. »
b) *Seminars* should cover the items « discussion period, » « tutorial, » « seminar. »
c) *Practicals* should cover the items « class, » « practical class, » « field period. »

To define research satisfactorily presents many difficulties. The definitions given below should be taken as a basic guideline.

FUNDAMENTAL RESEARCH[2]

428. Work undertaken primarily for the advancement of scientific knowledge, without a specific practical application in view.

Work undertaken primarily for the advancement of scientific know-knowledge, without a specific practical application in view.

APPLIED RESEARCH[2]

429. Administration should include both the administration of faculty or departmental affairs and overall university (or other higher institution) administration.

430. It is realised that it will be quite long before several countries are in the position to provide comparative data of this nature, but it is hoped that a start will be made in thinking about the problems of staffing in higher education in this way.

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[1] See chapter VII, table 16.

[2] See « Proposed Standard Practice for Surveys of Research and Development, » Organisation for Economic Cooperation and Development, Directorate for Scientific Affairs. These definitions are taken from Section II of above publication, « Basic Definitions and Conventions. »

Table H. STAFF OF INSTITUTIONS OF HIGHER EDUCATION BY STATUS AND FIELD OF SPECIALISATION

STATUS OF STAFF → FIELD OF SPECIALISATION ↓	ACADEMIC STAFF						NON-ACADEMIC STAFF
	SENIOR LEVEL		MIDDLE LEVEL		JUNIOR LEVEL		
	TOTAL	OF WHICH NO TEACHING	TOTAL	OF WHICH NO TEACHING	TOTAL	OF WHICH NO TEACHING	
Pure Sciences							
Architecture							
Technology							
Medical Sciences							
Agriculture							
Humanities							
Fine Arts							
Education							
Law							
Social Sciences							
Other Fields							
Not classifiable by field of specialisation[1]							
Total							

1. Persons not attached to a particular faculty, department or field of specialisation.

INTERNATIONAL COMPARISONS OF THE STOCK AND DEPLOYMENT OF *EDUCATED PEOPLE*

431. Reliable comparisons of the number and qualifications of educated people in the labour force (and outside the labour force) between countries at different stages of economic development could throw a great deal of light on the nature of the relationship between education and economic growth. Even the simplest hypotheses are at present only partly testable for lack of suitable information. Attempts to show a relationship between stocks of various types of highly qualified manpower and the level or rate of growth of G.N.P. are thwarted by the lack of data, and the absence even of agreed definitions as to what constitutes high-level manpower. Furthermore, only when detailed data on the distribution of qualified manpower are available is it possible to make reasonable estimates of the likely impact of economic growth targets on the need for different types of qualified manpower, and thence on the educational system. As has been indicated earlier, the absence of long time series makes this an area in which international comparisons are likely to be particularly important, as a means of checking the reasonableness of projections, if for no more positive purpose. It is recommended that the basic table to be aimed at should correspond to the proposed table 17 of the national tabulation scheme. This is the number of persons with each educational qualification and educational attainment by broad age group and sex, by occupational title and by branch of economic activity. For such comparisons to be worthwhile it is vitally important that the classification scheme

TABLE I. WORK OF ACADEMIC STAFF OF INSTITUTIONS OF HIGHER EDUCATION : HOURS DEVOTED TO EACH MAJOR ACTIVITY DURING THE YEAR[1]

ACTIVITY →	WORK IN INSTITUTIONS OF HIGHER EDUCATION							WORK OUTSIDE THE INSTITUTION	TOTAL HOURS WORKED
	TEACHING				RESEARCH	ADMINISTRATION	OTHER WORK		
STATUS AND SPECIALIZATION ↓	LECTURES	SEMINARS DISCUSSIONS	PRACTICALS	OTHER TEACHING					
Pure Sciences :									
a) Senior Staff									
b) Middle-level Staff									
c) Junior Staff									
Architecture :									
a) Senior Staff									
b) Middle-level Staff									
c) Junior Staff									
Technology :									
a) Senior Staff									
b) Middle-level Staff									
c) Junior Staff									
Medical Sciences :									
a) Senior Staff									
b) Middle-level Staff									
c) Junior Staff									
Agriculture :									
a) Senior Staff									
b) Middle-level Staff									
c) Junior Staff									
Humanities :									
a) Senior Staff									

a) Senior Staff									
b) Middle-level Staff									
c) Junior Staff									
***Education* :**									
a) Senior Staff									
b) Middle-level Staff									
c) Junior Staff									
***Law* :**									
a) Senior Staff									
b) Middle-level Staff									
c) Junior Staff									
***Social Sciences* :**									
a) Senior Staff									
b) Middle-level Staff									
c) Junior Staff									
***Other Fields* :**									
a) Senior Staff									
b) Middle-level Staff									
c) Junior Staff									
***Staff not classifiable by specialisation* :**									
a) Senior									
b) Middle-level									
c) Junior									
All Academic Staff									

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1. Start at the beginning of the academic year, and include vacation work where possible.

of branch of activity, of occupation, and of educational qualification be as broadly acceptable as possible.

BRANCH OF ACTIVITY CLASSIFICATION

432. Conventions of the classification of economic activities by branch of economic activity are already widely accepted in the shape of the International Standard Industrial Classification of all economic activities (ISIC)[1]. It is proposed that in classifying branches of activity for purposes of international comparisons for educational planning, the major branches of economic activity as defined in ISIC should be used as a basis except that in major branches three and four (Manufacturing Industry) certain industries which appear to be particularly heavy users of qualified manpower should be separately distinguished. These are *i*) chemicals and *ii*) other engineering products. Similarly, within the branch of activity, Other Services, it is suggested *i*) Education, *ii*) Health, *iii*) Public Administration and *iv*) the Armed Services be treated separately. It should be noted that ISIC is an *industrial* classification and not a *commodity* classification and that therefore the branch « education » includes some activities, e.g. school meals, that are not part of the commodity education, and that some education, or at least training, is given in enterprises that are in other economic branches (training schemes in factories, etc.). This problem can only be tackled on an ad hoc basis.

OCCUPATIONAL CLASSIFICATION

433. In the case of the occupational classification, a similar set of conventions exists in the International Standard Classification of Occupations (ISCO)[2]. This system was created before the recent upsurge of interest in the use of forecasts of occupational requirements for purposes of educational planning, and it is widely accepted that if a special system were devised for educational planners it would differ in some respects from ISCO. However, it is practicable to recommend the use of ISCO as an initial basis for the compilation of occupational data for educational planners.

434. A considerable amount of confusion has been caused in many cases by the attempt to treat occupational groups as if they were defined in terms of level of education or qualifications required for their jobs. Thus, for example, the terms « high-level occupations, » « highly-qualified manpower » and « people with university training » have often been treated as synonymous terms. Clearly, there is considerable correlation between occupational title, function, and level and type of educational qualifications, particularly at the more highly qualified end of the scale, but the available evidence indicates that this is a subject for study and analysis, rather than a fact to be taken as a basis for estimates of qualified manpower needs. It is not possible at the present time, therefore, to make any recommendations about re-arranging data tabulated in terms of occupations into implicitly educational groups corresponding to « highly qualified manpower, » « qua-

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[1] International Standard Industrial Classification, Statistical Studies, Series M to 4. United Nations, New York.

[2] International Standard Classification of Occupations, International Labour Office, Geneva.

lified manpower, » « untrained manpower, » etc. For the time being attention should be devoted to producing those cross-tabulations which permit the extent of the correlation between occupation and educational attainments to be assessed.

435. It is proposed that the ten major occupational groups of ISCO should be used as a basis for tabulations of occupations for international comparisons with, however, a modification similar to that suggested in the case of ISIC, namely that those major occupational groups which appear *a priori* to be of special interest to educational planners should be treated in greater detail. This means, in practice, that the ISCO, major group «0» — Professional, Technical and Related Workers — should be examined in considerably greater detail, and the ISCO major group « 1 » — Administrative, Executive and Managerial Workers — should be treated in rather more detail. In addition, figures relating to the number of teachers of various kinds which are clearly of special interest to educational planners are inadequately dealt with in terms of the ISCO system of classification and should be dealt with separately. It is proposed that the suggestion made for national tabulation schemes of adopting the grouping suggested by Parnes[1] should be more formally adopted for international comparisons. This re-grouping of ISCO into 33 broad occupational groups is reproduced as an annex.

CLASSIFICATION OF EDUCATIONAL QUALIFICATIONS

436. International comparisons of educational qualifications present much more serious problems. There is no widely accepted classification scheme of educational qualifications and the subject has been treated in the population censuses of most countries in a variety of ways. It is highly desirable that at future population censuses definitions and systems of classification should be used that are as comparable as possible.

437. Methods of classifying data on the educational characteristics of the adult population have been discussed at length in chapter VII. It makes little sense for a further lengthy discussion in the present context since, in any case, the collection of a substantial amount of new data must await the next round of population censuses. It is suggested, however, that educational planners will find it convenient if all countries, as a result of that census, are able to provide the information on educational attainment and educational qualifications suggested in that chapter. In summary, it is recommended that information be obtained both on the number of grades of full-time education completed and on all educational qualifications held. For international comparisons the qualifications can most usefully be grouped in accordance with the framework suggested in the previous tables for statistics of new qualifications. The tabulation is shown in Table J[2]. Data on educational attainment and qualifications are shown in the same proposed tabulation. In the first case, the entire population above the minimum working age will be covered. In the second only persons who have a qualification will be listed. Although for many types of comparisons interest focuses on qualifications, in order to compare the general level of education of one country with that of another, the educa-

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[1] *Forecasting Educational Needs for Economic and Social Development, op. cit.*
[2] See pages 220-223.

tional achievements of all persons must be taken into consideration. There are countries where a high percentage of persons in some occupations have university and equivalent qualifications. The average educational attainment (number of completed grades) in the same countries for the whole population turns out to be very low. For international comparisons, two ways of treating this question should be avoided. They are :

1. to collect information on number of years of study completed, rather than grades completed. This conceals all retardation and acceleration.
2. to try to find out the level of education reached by people, by asking them at what age they left school, or ceased full-time formal education, etc. This question would give very unreliable results. Conclusions about the amount of education obtained can only be deduced with difficulty. Apart from the problems of retardation and acceleration, the school attendance regulations and customs in most countries have changed radically during the last 50 years. Also, there are gaps and interruptions in many people's education, so that the use of the concept, final age of full time study will lead to incorrect estimates of the amount of education actually received. It is further the case that this method makes it difficult to take into account part-time study.

EXPLANATORY NOTES AND DEFINITIONS FOR THE PREPARATION OF TABLE J

1. Educational Characteristics of the population are measured by

a) educational attainment (UNESCO definition is « highest grade of the highest level completed »)

b) highest qualification obtained. This allows for a study of type of education received. Persons appearing in (*b*) *must be listed in* (*a*) *also.*

2. *Age*. The following age breakdown is suggested :

below 15 years
15-24 »
25-34 »
35-44 »
45-54 »
55-64 »
65 and over.

3. *Occupation*. The breakdown shown here is based on a regrouping of the International Standard Classification of Occupations. See Annex VIII for further details.

4. *Branch of Industry*. This breakdown is based on the International Standard Industrial Classification.

0 Agriculture, Forestry, Hunting and Fishing.
1 Mining and Quarrying.
2-3 Manufacturing.
  31 Manufacture of Chemicals and Chemical Products.
  32 Manufacture of Products of Petroleum and Coal.
  34 Basic Metal Industries.
  35 Manufacture of Metal Products, Except Machinery and Transport Equipment.
  36 Manufacture of Machinery, Except Electrical Machinery.
  37 Manufacture of Electrical Machinery, Apparatus, Appliances and Supplies.

38 Manufacture of Transport Equipment.
39 Miscellaneous Manufacturing Industries.
4 Construction.
5 Electricity, Gas, Water and Sanitary Services.
6 Commerce.
7 Transport, Storage and Communication.
8 Services.
811* Government Services : Defence.
812* Government Services : Public Administration.
821 Educational Services.
822 Medical and other Health Services.
823* Research and Scientific Institutions.
89* Other Services.
9 Activities not Adequately Described.

5. Illiterates who have received some formal education are distinguished from those who have not, so they can be subtracted from the total in the first part of the table dealing with educational attainment, in order to avoid double-counting, because they will also appear as having completed some grades.

6. Primary and Secondary Education are not shown separately. The same applies to type of education at this level. The information on type will be obtained in the second part of the table on qualifications. Here one year of general education is considered the same as one year of technical education, and the total number of completed grades of both general and specialised education should be considered. Whereas it is often difficult to distinguish primary from secondary education, higher education usually forms an easily identifiable homogeneous block. Also in many countries, grades of years of study are not meaningful as far as higher education is concerned. This is why higher education is not shown as a continuation of secondary, showing « grades 13 and 14, » etc. In countries where this is possible, it should be done. Even where grades cannot be shown, those persons who have some higher education should be shown separately from those who have obtained a higher qualification. Part-time education should be estimated in full-time equivalents.

7. Only a very brief summary of qualifications by level are shown here. The same breakdown is given as for the tables on enrolment. However, the amount of detail used by each country in table 10 of chapter VII can be used for this tabulation. As far as fields of study are concerned, only a highly aggregated list is given, but this can be extended a great deal. (See table 6 of chapter VII.) Persons obtaining equivalent qualifications through channels other than the formal educational system should be included. Field of study should be shown separately for qualifications :

a) below level of recognised first degree ;
b) first degree ;
c) post-graduate degree.

PUBLIC AND PRIVATE EDUCATIONAL EXPENDITURE IN RELATION TO TOTAL PUBLIC EXPENDITURE AND NATIONAL INCOME

438. Table K asks for data that will enable educational expenditure to be compared with total Public Expenditure, Gross National Product and its components.

As far as is possible, accepted National Accounts procedures have been adhered to.

439. Final expenditures for both public and private education are asked for, distinguishing in both cases, current purchases of goods and services and capital purchases. In addition, one transfer item is considered. This

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* These groups do not correspond exactly with the ISIC classification (see previous text).

TABLE J. EDUCATIONAL CHARACTERISTICS OF T
BY AGE, SEX, OCCUPATI

EDUCATION OF POPULATION → OCCUPATION ↓	TOTAL — ALL PERSONS	[illegible]			
		GRADUATES		[illegible]	
		[illegible]	[illegible]	[illegible]	[illegible]
1. Architects					
2. Engineers					
3. Physical Scientists, Mathematicians					
4. Biologists, Veterinarians, Agronomists, Related Scientists					
5. Professional Medical Personnel					
— Physicians, Surgeons					
— Dentists					
— Other Prof. Medical Workers					
6. University Science Teachers					
7. Secondary School Science Teachers					
8. Administrators, Executives, Managers					
— Employed in Government					
— Directors, Managers, Working Proprietors					
9. University Teachers (except Science)					
10. Secondary School Teachers (except Science)					
11. Teachers not elsewhere classified (not elementary or nursery school)					
12. Economists, Professional Accountants, Actuaries, Statisticians					
13. Social scientists (except economists)					
14. Artists, Writers, Creative Artists					
15. Other Professional Workers					
16. Technicians and Draughtsmen in Science and Engineering					
— Engineering Technicians					
— Research laboratory Technicians					
— Industrial laboratory Technicians					
— Not elsewhere classified Technicians					
— Draughtsmen					
17. Surveyors					
18. Medical, Dental Technicians					
19. Nurses, Professional					
20. Transport and Communications Technicians					
— Deck officers, Engineer Officers, etc.					
— Aircraft Pilots, Navigators, etc.					
— Radio-communications operators					
— Inspectors, Traffic Controllers, etc.					
21. Non-working Foremen (Supervisors)					
22. Primary, Nursery School Teachers					
23. Salesmen of Insurance, Securities					
24. Other Technicians, etc. n.e.c.					

See explanatory notes and definitions in *preceding paragraphs*.

1. The same field of study breakdown should be used as is shown for first degrees and equivalent qualifications.

PULATION OF MINIMUM WORKING AGE AND ABOVE, D BRANCH OF INDUSTRY

TAINMENT				HIGHEST QUALIFICATION OBTAINED																		
E NO CATION CATION				PRIMARY LEVEL	SECONDARY LEVEL				HIGHER LEVEL													
		PERSONS WITH SOME HIGHER EDUCATION, BUT NO HIGHER QUALIFICATION	PERSONS WITH ONE OR MORE HIGHER QUALIFICATIONS		GENERAL (a)	GENERAL (b)	VOCATIONAL, TECHNICAL (a)	VOCATIONAL, TECHNICAL (b)	DIPLOMA, ETC., BELOW 1st DEGREE	FIRST DEGREE	OF WHICH : FIELD OF STUDY[3]											POST GRADUATE DEGREES
9 OR 10 GRADES	11 OR 12 GR., ETC.										NATURAL SCIENCES	ENGINEERING	TECHNOLOGY	MEDICAL SCIENCES	AGRICULTURE	HUMANITIES	FINE ARTS	EDUCATION	LAW	SOCIAL SCIENCES	OTHERS (N. E. C.)	

Continued pages 222, 223 →

TABLE J. (Cont'd). EDUCATIONAL CHARACTERISTICS OF T
BY AGE, SEX, OCCUPATI

EDUCATION OF POPULATION → OCCUPATION ↓	TOTAL — ALL PERSONS	EDUCATION			
		GRADUATES		[illegible]	
		[illegible]	[illegible]	1 OR 2 [illegible]	3 OR 4 [illegible]
25. Clerical Workers					
26. Sales Workers, n.e.c.					
27. Skilled Manual Workers					
28. Skilled Service and Recreation Workers					
29. Athletes, Sportsmen, Related Workers					
30. Farmers, Fishermen, Hunters, Related					
— Farmers, Farm Managers					
— Farm workers, n.e.c.					
— Hunters, Fishermen, Loggers, Related					
31. Unskilled Sales Workers					
32. Unskilled Manual Workers					
33. Unskilled Service and Recreation Workers					
34. Miscellaneous and n.e.c.					
Total — Labour Force					
Total — Inactive Population					
of whom — in educational system					
Total — Population of minimum working age and above					

See explanatory notes and definitions in preceding paragraphs.

1. The same field of study breakdown should be used as is shown for first degrees and equivalent qualifications.

PULATION OF MINIMUM WORKING AGE AND ABOVE, D BRANCH OF INDUSTRY

ATTAINMENT				HIGHEST QUALIFICATION OBTAINED																		
R NO CATION CATION N		FINISHED WITH SOME HIGHER EDUCATION, BUT NO HIGHER QUALIFICATION	FINISHED WITH ONE OR MORE HIGHER QUALIFICATIONS	PRIMARY LEVEL	SECONDARY LEVEL				HIGHER LEVEL													
9 OR 10 GRADES	11 OR 12 GR., ETC.				GENERAL (a)	GENERAL (b)	VOCATIONAL, TECHNICAL (a)	VOCATIONAL, TECHNICAL (b)	DIPLOMAS, ETC., BELOW 1st DEGREE	FIRST DEGREE	OF WHICH : FIELD OF STUDY³											POST GRADUATE DEGREES
											NATURAL SCIENCES	ARCHITECTURE	TECHNOLOGY	MEDICAL SCIENCE	AGRICULTURE	HUMANITIES	FINE ARTS	EDUCATION	LAW	SOCIAL SCIENCES	OTHERS (n. e. c.)	

is sums paid to individuals for education. In actual terms, this represents grants, loans, and all other direct forms of aid to students. Indirect subsidies to pupils and students in the form of cheap dining facilities, health services, etc. will appear as direct purchases of goods and services by public of private suppliers of education.

440. Sources of finance are not directly considered in this table. A few items are singled out as being of particular interest. They represent transfer payments of one kind or another:

1. Transfers from central to local government for education (and vice-versa if such movements took place).
2. Net transfers from central and local government to private educational establishments.
3. Transfers from central and local government to individuals.
4. Private transfers to individuals for education.
5. Sums paid for tuition fees by individuals. This is the only item in the costs incurred by individuals for education, that is asked for. It is not considered appropriate to introduce imputed values into a table of strict accounts and international comparisons. It is interesting to note what fees are paid in various countries for tuition.
6. Sums received by individuals for their education. This is the counterpart to items 3), 4) and 8) below. All of the other transfer items listed appear elsewhere as purchases of current or capital goods and services. This item is included because it can legitimately be considered as an educational expense by the three groups who make funds available to pupils and students. Besides international comparisons of aid to students should be made.
7. Sums paid by charities, foundations, enterprises, international organisations (called Other Bodies — Private Organisations here) to public or private educational institutions. Using accepted national accounts procedures, all sums paid by private bodies to or for goods and services in the public sector are to be considered transfers from the private to the public sector. This means that for these accounts, even when goods and services are purchased directly by private organisations on behalf of public educational institutions, these payments are to be considered as purchases of goods and services by the public sector, financed by a transfer from the private sector.
8. Sums paid to individuals — aid to students by Other Bodies — Private Organisations. This item has been discussed above.

441. Total Public Expenditure for Education can be compared with Total Public Expenditure and Total Expenditure for Education with Gross National Product. The items included should follow accepted national accounts definitions.

DISTRIBUTION OF CURRENT EXPENDITURE FOR EDUCATION

442. In Table L, current educational expenditure is distributed by type, and type of institution for which it is spent. Institutions are classified as in all the previous tables on the educational system itself.

TABLE K. PUBLIC AND PRIVATE EXPENDITURE ON EDUCATION IN RELATION TO TOTAL PUBLIC EXPENDITURE AND GROSS NATIONAL PRODUCT

EXPENDITURE FOR EDUCATION	AMOUNT
I. PUBLIC EDUCATIONAL EXPENDITURE :	
Current : Purchases of goods and services	
a) Central Government	
b) Other Government	
Capital : Purchases	
a) Central Government	
b) Other Government	
Plus : Net central and local government transfers to :	
a) Private educational institutions	
— current	
— capital	
b) Individuals	
Total Public Expenditure on Education	
a) Current : for goods and services	
b) Capital : purchases	
c) Transfers : current	
capital	
II. PRIVATE EDUCATIONAL EXPENDITURE :	
1. *Private Educational Institutions* :	
Current : Purchases of goods and services	
Capital : Purchases	
Minus : Net transfers from public authorities	
Plus : Transfers to individuals	
2. *Individuals* (transfers) :	
Tuition fees paid to public institutions	
Tuition fees paid to private institutions	
Aid received from public authorities	
Aid received from private institutions	
Aid received from private organizations	
3. *Other Bodies — Private Organizations* (transfers) :	
Sums paid for public institutions	
Sums paid for private institutions	
Aid to students	
III. TOTAL EXPENDITURE FOR EDUCATION :	
Current : Purchases of Goods and Services	
Capital : Purchases	
Transfers : (to individuals only) — public	
— private	
IV. TOTAL PUBLIC EXPENDITURE :	
Total Current : Expenditure of general government	
Total Capital : Expenditure of general government government's gross Fixed Asset formation	
V. GROSS NATIONAL PRODUCT at market prices :	
Gross Fixed Asset Formation	

Table L. DISTRIBUTION OF CURRE

1. Pub
2. Priv

	DIRECT EXPENDITURE FOR GO						
TYPE OF EXPENDITURE →	GENERAL ADMINISTRATION	INSTRUCTIONAL EXPENDITURE		OTHER CURRENT EXPENDITURE			
TYPES OF INSTITUTION ↓		WAGES, SALARIES OF TEACHERS	OTHER INSTRUCTIONAL EXP.	CANTEEN, DINING FACILITIES	BOARDING FACILITIES, RESIDENCES	TRANSPORTATION	LIB RE TEX BOO
Pre-primary — Total							
Primary — Total							
Secondary — Total							
— general							
— technical, vocational							
Higher — Total							
— Universities and equivalent (degree-granting)							
— Other Higher							
Other Institutions							
Other Expenditure (not classifiable by institution)							
Total							

Current expenditure is again broken down to show :

a) Direct Expenditure for Goods and Services,
b) Transfers to Individuals (aid to students).

443. Item (*a*) is further subdivided to show expenditure for general administration, instruction and other current expenditure. Other current expenditure will include the ancillary welfare services made available to pupils and students. All forms of indirect aid, i.e. subsidies to pupils and students in the form of goods and services provided at less than market price, will be included. A few of these services are listed specifically in the table, but countries may extend this as is necessary.

444. Item (*b*) shows amounts transferred to students, and refers to payments made directly to students for education, and which are spent by students themselves. This list too, can be extended to take into account the diverse forms of aid existing in OECD countries.

445. Not all expenditure is clearly earmarked for a particular institution. For example, school buses may service neighborhoods having several different types of institution. A row « other expenditure, not classifiable by institution » makes allowance for such cases.

PENDITURE FOR EDUCATION

CATION
CATION

D SERVICES			TRANSFERS TO INDIVIDUALS (AID TO STUDENTS)				INTEREST, LOAN REPAYMENTS	OTHER CURRENT EXPENDITURE (N. E. C.)	TOTAL
CATION OF WHICH									
ALTH, LFARE	SPORTS, RECREATION	OTHER (SPECIFY)	GRANTS	LOANS	PRE-SALARIES	OTHER FORMS OF ASSISTANCE			

446. In many ways, this table will be the most important from the point of view of international comparisons of educational finance.

CAPITAL EXPENDITURE BY TYPE OF INSTITUTION

447. Table M summarizes capital expenditures on each of the main types of institution by public and private authorities. In view of the often complicated financial flows between different public authorities for capital purposes, and the difficulty of attribution of particular expenditures to central or local authorities, no distinction is made between central and local authorities' expenditure, and only *final expenditure* is considered. In addition, such information is not of high priority for purposes of international comparison. It does seem useful, however, to distinguish transfers from public authorities to private authorities for school building purposes. These will usually appear in the form of school building grants and will be fairly readily distinguished. The column headed « private authorities » will, therefore, include all capital expenditures by private educational authorities whatever the origin of the funds and the following column will distinguish that part of the funds which was transferred from public authorities. The column headed « public institutions » will include only actual expenditures for capital purchases for public institutions.

Table M. CAPITAL EXPENDITURE BY TYPE OF INSTITUTION

TYPE OF INSTITUTION	PUBLIC INSTITUTIONS	PRIVATE INSTITUTIONS	
		TOTAL	OF WHICH: FINANCED BY TRANSFERS FROM PUBLIC AUTHORITIES
Pre-primary			
Primary			
Secondary:			
general			
technical			
Higher:			
— Universities and Equivalent (degree-granting)			
— Other Higher			
Other Institutions			
Other expenditure, not classifiable by institution			
Total			

Chapter X

DIRECTIONS FOR FURTHER WORK

INTRODUCTION

448. The present handbook clearly has not said all that there is to say about educational statistics. It has developed the basic elements of a statistical tabulation scheme for global educational forecasting and planning, taking into account different approaches, and it has considered the possible uses of international comparisons by national educational planners. It has proposed a series of tabulations which, if completed, would provide much of the data necessary for aggregate long and medium-term educational planning of the formal educational system. It has proposed a second set of tables based upon a standardised statistical framework which would provide an initial set of internationally comparable educational data. It is quite certain, however, that for many purposes educational planners will be seeking additional data, and it is also hoped that during the course of time more and more of these national data can be put on to an internationally comparable basis.

449. This final chapter lists some of the areas in which further work would be particularly useful, as regards both statistics for planning and the collection of internationally comparable data. It concludes with a few remarks about the organisation of statistical collection and processing for educational planning.

SHORT-TERM PLANNING STATISTICS

450. An important area that has not been dealt with is that of statistics that might be used for short-term planning, except to the extent that the basic flow model can be used for short-term purposes. A number of more detailed indicators are, however, possible for short-term predictions. For example, in the short period quite accurate forecasts can be made of the number of pupils who will be successful in one level of education by looking at the number who achieve certain results in the previous level[1]. It is possible to use this technique to forecast two or three years ahead the number of pupils who will be applying for university places in particular subjects. The results of internal examinations in the schools could also be used for this purpose (as indeed they almost certainly are by the schools themselves) if the data were collected by the statistical authorities. It is recommended, therefore, that work be undertaken to improve these short-term forecasting indicators which, if used properly, and if acted upon, can help to avoid short-term disequilibria.

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[1] See Annex 1 for an account of this kind of study in the Netherlands.

451. Related to this issue is the question of whether early measures of students' intelligence can be used to predict subsequent performance. Some experimenters claim that measures of students' intelligence taken at the age of six, within a few days of entering school, provide a remarkably accurate indicator of the likelihood of entering gymnasia some six years subsequently. Since entry to gymnasia is a good indicator of likely entry to university it ought to be possible by this method to predict demand for university places some 12-15 years in advance. In fact, this matter is so controversial and raises so many issues outside the range of educational planning as defined in this handbook that it cannot be discussed here. However, educational planners should be conscious of the possibility of using the results of ability tests of various kinds to improve their estimates of the various coefficients of their models. Much depends upon the structure of the particular educational system. Forecasts of students' performances on the basis of intelligence are perhaps easier in systems which single out the clever pupils at an early age for gymnasia or grammar schools, thus in a way ensuring that the forecasts are self-fulfilling. They would be more difficult in comprehensive school systems.

452. Another method of short-term forecasting that might be further developed consists simply in asking pupils what they intend to do. For periods of 2-3 years into the future this might be a good predictor of demand for places. The application of this method, however, demands great care because few people are capable of answering reliably conditional questions such as, « What will you do if... ? » Here again, much depends upon the educational system, upon the age of the pupils and upon the way the questions are asked. Questioning pupils about their intentions is often a reliable approach in those branches of education which lead traditionally to a particular destination ; the clearest example is the upper level of gymnasium education which normally orients its pupils towards the university.

453. Similar short-term indicators of teacher supply and teacher wastage should also be developed. More attention should be devoted to part-time teachers and unqualified teachers, than has been suggested in this handbook. The short-term factors affecting the return of married women into the teaching profession are almost unknown and, similarly, there are undoubtedly a large number of short-term factors which affect the decisions of university graduates, whether or not to enter the teaching profession. This last can be very important since once a graduate has made the initial decision to enter teaching there is almost certainly a higher probability of his remaining a teacher than if he has made some other initial choice.

INFORMAL EDUCATION

454. A branch of education that has been very largely neglected is that of « informal » education and training. The handbook has claimed that the educational planner needs statistical information on all types of education and training which can serve as substitutes for the branches of education which he is trying to plan. This has been used as a major justification for making substantial efforts to collect data on private education. It should be used to justify the collection of information on informal training, on-the-job training, apprenticeship schemes[1], etc.

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[1] Education and training in the armed services should not be neglected insofar as skills are acquired which are likely to be of use in civilian economic life.

455. This type of training has, of course, also some very important policy implications in itself. For example, if informal training schemes are wanted by firms and if they are organised in such a way that they satisfy the philosophic principles of educators, they can relieve a part of the burden of financing education from the public authorities. So little is known about this very important branch of training that at present it is impossible to make proposals for general statistical treatment. It is suggested, therefore, that further work be undertaken both at the conceptual level to decide what data are necessary, and at the practical level to decide what it is feasible to try to collect. It may usefully be repeated that, as a general principle, any form of training which is in any way a substitute for education provided by the public authorities should come within the purview of statistical knowledge of these authorities[1].

ADULT EDUCATION

456. A related topic on which almost nothing has been said is adult education in its various forms. Adult education has various manifestations. In the first place, it can refer simply to some of the leisure time activities of the adult population which they undertake for recreational purposes. Secondly, it can refer to similar courses undertaken by individuals during their leisure time but with a view to improving or increasing their marketable talents. It is possible that, for example, learning a foreign language or learning to type could come under this heading. Thirdly, it can refer to more formal retraining schemes for adults to provide a new range of skills to people whose existing skills have been rendered obsolete by technical or economic developments. With the increasing speed of technical progress and economic change and with the emergence of the phenomenon of technological unemployment it is likely that such schemes will become increasingly important, not only at the lower levels of the skill range. Such retraining can take many forms, ranging from reading the professional journals to attending formally organised long courses. As has already been stressed in chapter IV, the educational planner needs to be fully aware of the educational implications of recent technological developments.

457. It is also the case that it is likely to become more and more common for adults, who have left the educational system, to return to it at some later stage in their life. All these areas must be the subject of considerably more research before it is possible to make general recommendations about statistical treatment.

ADDITIONAL MANPOWER DATA

458. In the general area of manpower statistics, a whole range of further data is desirable. One urgent need in many countries is for detailed data on occupational earnings. Ideally, data on the distribution of earnings in all occupations similar to the tabulations suggested for teachers would be available. These will be required not by the educational planner only, and it is to be hoped that labour market authorities will also feel some

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[1] Statistical information should be collected also on such activities as correspondence courses, educational television for adults, etc.

obligation to collect such information in place of the rather aggregated data available at present in most countries. It is to be hoped that it will prove possible to cross-tabulate it with the different educational categories that go up to make each occupation.

459. There is also a great need for information on the extent to which educational qualifications actually do qualify people to perform the occupations that they purport to, and the extent to which formal educational qualifications need to be supplemented by additional on-the-job training[1]. This question needs to be examined, of course, in both its long-term and short-term aspects. It may well be that, in the short-term, employers would prefer to have graduates specifically qualified for one particular occupation, whereas in the long-term they would prefer them to have the greater flexibility that general education would provide. The question can also be looked at in reverse. It is almost certain that some specialised training is never used in the occupation for which the training is given.

460. Further work is also necessary in the international movements of qualified manpower. A study being undertaken by the OECD on this subject may throw some light on this important problem area, and should also result in the establishment of a suitable statistical framework for its analysis.

EFFICIENCY OF EDUCATIONAL INSTITUTIONS AND OPERATIONAL RESEARCH METHODS IN EDUCATIONAL PLANNING

461. The question of the efficiency of educational institutions is another that has not been adequately dealt with. This includes detailed investigation of questions such as student wastage and retardation and repeating of courses. It also comprises investigations into the effects of different pupil/teacher ratios as well as detailed investigation of the introduction of new teaching techniques and new teaching aids. Elaborate mathematical models can be constructed for the analysis of retardation, wastage, teacher supply problems, etc.[2]. The most effective of these are likely to be based on extensions of some of the tabulations suggested in chapters II, V and VII. If operational research techniques come to be used extensively in educational planning, one of their major contributions is likely to be the analysis of problems of this type.

462. Among the many problems which are particularly susceptible to this type of analysis are the optimal location and size of schools, the programming of educational reforms using network analysis, the establish-

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[1] One important statistical exercise that should be undertaken from time to time — perhaps in conjunction with population censuses — is the collection of information on the number of people who have already undertaken some vocational training or retraining in addition to their formal education. Several studies have shown that there is a fairly strong positive correlation between amount of formal education and amount of subsequent vocational training and retraining. If this complementarity proves to be the general case, this would have important implications for policy formulation in this area.

[2] See, for example, *Educational Planning: Its Quantitative Aspects and its Integration with Economic Planning*, by Hector Correa, International Institute for Educational Planning, 1965.

See also *Les Déperditions d'Effectifs Scolaires : Analyse Théorique et Application*, by Daniel Blot, Tiers-Monde, numéro 22, avril-juin 1965.

ment of criteria for evaluating capital projects and of improved procedures for budgetary control of educational systems, the clarification of educational objectives, which often conflict with one another, analyses of decision-making structures so as to pinpoint optimal points for intervention by the planning authorities, as well as a whole range of smaller scale problems such as school transport scheduling, organisation of school timetables, etc.

463. The development of operational research in educational planning can mean a great development of cost/benefit types of analysis, sensitivity analysis, the construction of simulation models, etc. At present, the types of statistical data that will be necessary for carrying out such studies can be only dimly seen, but there is no doubt that eventually they will be considerable, and that they will only realistically be encompassed within the framework of an automated individualised data system.

DATA ON TEACHERS

464. Another subject which needs considerably more detailed treatment than has been possible in this handbook, is that of specialisation of teachers, particularly at secondary level. As has been mentioned, planning of teacher supply makes very little sense unless account is taken of the need for teachers of different specialisations. It is very often the case that even where some types of teachers are in short supply, particularly mathematics and science teachers, there is often no difficulty in finding teachers of other specialisations[1].

465. It may be noted that a teacher shortage in certain subjects often manifests itself through the particular subject being taught by teachers who are qualified by their own education to teach other subjects. For example, the situation may well arise where a teacher of history teaches mathematics as a subsidiary subject. A detailed analysis of the teaching load of all teachers classified by their own educational specialisation would be necessary in order to elucidate this issue.

466. Another important set of characteristics of the teacher stock is the function and status of teachers. For the most part, in the proposed statistical tabulations, teachers, with the exception of university teachers, have been treated as if there were only one type of teacher with one type of function, i.e. to stand in front of a class of children and to instruct it. There are, of course, a number of different function and status groups within the teacher force ranging from headmasters of large institutions to junior assistant teachers. One aspect of a rapidly expanding educational system is likely to be an increasing proportion of teachers at the lower level. One reason for this is that some of the expansion at least will be provided for by expanding existing institutions, which is unlikely to increase the number of headmasters as rapidly as it increases the number of assistant teachers. More important is the fact that sooner or later many countries are likely to find it necessary to use auxiliary teachers in many branches of education. These are important issues in the analysis of teacher supply problems.

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[1] See, for example, Secretariat Reports to Fourth and Fifth Conferences of European Education Ministers. (London, April 1964 and Vienna, October 1965.)

EDUCATIONAL BUILDINGS

467. Very little has been said about problems of estimating requirements in buildings and in equipment. It has perhaps rather naively been assumed that each additional pupil will require an additional school or university place and that a certain number of places will need to be created in order to overcome overcrowding of school facilities and to replace obsolete educational buildings and to provide buildings in areas of growing population. There is, however, a wide range of issues involved in educational building programmes, many aspects of which are dealt with in *Effective Use of School Building Resources*, by G. Oddie (OECD, 1966). It is to be hoped that some of the proposals of that volume can be incorporated into the general statistical framework at some stage.

EDUCATIONAL INSTITUTIONS

468. A related major topic, which needs much deeper statistical treatment than it has received heretofore, concerns the characteristics of individual educational institutions. It should be possible to develop systems of individualised data collection and control registers for institutions as well as for individual pupils and teachers. This is an important adjunct to the data on individual characteristics of pupils, and may in some instances be more significant. For example, the quality of the primary school attended may well have more influence on a pupil's performance at secondary school than either his father's occupation or his own inherent intelligence.

469. Ideally, a complete file of all educational institutions should be available to the planner. This would provide the best way of linking data on pupils, teachers and finance. This subject has been considered in chapter II and chapter VIII; it is mentioned again here because it is likely to become one of the major developments in educational statistics.

ADMINISTRATIVE PROBLEMS RELATED TO DATA COLLECTING

470. From time to time reference has been made to some of the administrative problems involved in the collection of educational statistics. Chapter VIII for example, stresses the need to make educational data available as rapidly as possible both for administrative and planning purposes. A comprehensive investigation of the methods and institutions of educational data gathering should be undertaken in any country that wishes seriously to undertake educational planning. Such a study should make it possible to identify the bottlenecks which prevent or slow down the reporting or publishing of educational data.

471. Few generalisations can be made in the present context. It is of major importance whether the educational administration is centralised or whether there are a number of more or less autonomous authorities. At first sight, it might be assumed that data reporting would be quite straightforward in countries which administer the whole educational system from one single centre in the capital city, and that it would be complicated and slow in Federal States where every Province or State has its own Ministry of Education and independent statistical office. However, this does not necessarily appear to be the case in practice. In one highly centralised country, educational data often became available only after long delays,

though an enquiry showed that the organisation of data reporting within the educational system was excellent and rapid at all levels, from the individual schools to the Ministry of Education. The delays were, to a large degree, due to the lack of communication channels between the Educational Ministry and the National Statistical Service. On the other hand, in Germany, a highly federal country as far as education is concerned, it has been shown that a federal structure need not prevent the establishment of an efficient national system of educational data collection. An analytic flow chart showing the channels through which data are forwarded from the schools to the national planners would facilitate the identification of bottlenecks.

EDUCATIONAL RESEARCH

472. There is finally the question of educational research and the effects of educational research on educational practice. It is known that in most countries expenditure on educational research accounts for only an infinitesimal part of educational expenditure or of research and development expenditure. Much deeper study of this whole area is vitally necessary both nationally and internationally. It is highly desirable as a first step to measure the total amount of money expenditure on educational research but subsequently more detailed analyses should be attempted.

CONCLUDING REMARKS

473. This list of omissions and suggestions for further work can best be summarised in the following way. The present handbook, as stated in the first chapter, sets out to establish the statistical needs for a rather aggregative educational planning exercise which would permit the elucidation or national policies with regard to the magnitude and orientation of the educational system, and which would permit global estimates of the resource requirements for education in terms particularly of teachers and of finance. Before, however, educational planning can be really effective operationally, it is necessary to move from the general to the particular. What this means in practice is that at the stage of implementation of national policies for education, if not before, it will be necessary to obtain a large amount of additional information to support the statistics contained in the general tabulation programmes outlined in this handbook. A particularly important aspect of this disaggregation must deal with the breakdown of data by geographic, economic and administrative region.

474. It is intended that this handbook should generate three types of activity in OECD Member countries. These are :

1. To stimulate in OECD countries the collection, in an economical manner, of the statistical data that are necessary for, and relevant to, effective educational planning.
2. To generate as rapidly as possible a comprehensive series of internationally standardised statistics through which the existing educational efforts, educational targets and possible ways of reaching the targets in OECD countries can be compared and evaluated.
3. To permit work to commence on the establishment of a « conversion key » with the aid of which national statistical tabulations can be

adjusted by individual research workers and others so as to fit the standardised international framework.

475. The first aim implies that OECD countries should examine their current systems of educational statistics and their tabulation schemes in order to ascertain in which areas they are particularly deficient. Where they are not already doing so, they should give particular attention to the establishment of individualised data systems, without which it is unlikely that more than a fraction of the necessary data can be efficiently recorded. In addition to this, thought should be given to the establishment of regular annual educational censuses of *all* educational institutions along the lines of agricultural censuses. Statistical authorities should also investigate the widespread use of sampling techniques in connection with the educational census and, in particular seek to establish a sampling frame which would be suitable for a number of different purposes. Finally, and perhaps most urgent chronologically, they should give serious thought to the use that can be made of the next round of population censuses in providing the data that can only be reasonably obtained from such censuses.

476. For the second objective, it is anticipated that a number of OECD countries will be willing to undertake to complete experimentally the draft tabulations for international comparisons. It the first instance, the data will be collected showing the situation in the most recent year for which complete data are available. It is hoped also, however, at least in some instances, to obtain comparable data on the basis of plans for the future so that it will be possible to compare not only the present educational system in Member countries but also their aspirations for the future.

477. The third type of activity under this heading which must be undertaken by the OECD Secretariat in co-operation with national authorities is to attempt to establish a « conversion key » for all OECD Member countries so that published national data can be readily converted on to the basis of the standardised system. The basis of this conversion key would be the classification scheme used in the draft tabulations of chapter IX. The work will involve the establishment of a set of rules for each OECD country to enable any set of national statistics using national definitions to be transcribed in such a way that the figures are readily meaningful in any other country. Analogous adjustment rules are used by National Income Statisticians to convert nationally published national income data on a standardised basis.

478. Implicit in all the proposals of this manual is the suggestion that any educational planning group unit must have a strong data and statistical unit. All too often at present the collection and processing of educational statistics is divorced from the use of the statistics for planning and policy purposes. As a result statistical information, as well as being inadequate, is often inappropriate for answering the questions that interest educational policy makers. The link between secondary and higher education is one example of this. Where statistical collection of all kinds is in the hands of the National Statistical Office, it is extremely important for the educational planning authorities to establish very close links with those responsible for the collection of educational statistics. Such links must be in any case created to deal with matters such as population censuses.

479. A particular aspect of this problem is the need to publish educational statistics as quickly as possible. It is very often the case at present that planners are working with data that are several years out of date. This does not make for effective educational planning.

480. The minimum aim in all countries which consider educational policy as an integral part of economic and social policy, a view to which the Ministers of Education of the Western European nations subscribed at their fourth meeting in April, 1964[1] must be to have accurate and up-to-date statistical information on the current situation within the whole of the educational system and the economy and society at large.

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[1] Council of Europe, document CME/IV (64) 10, Fourth Conference of the European Ministers of Education, Resolution No. 1, Article 1.

ANNEXES

Annex I

THE USE OF INDIVIDUALISED DATA AND COHORT ANALYSIS AS ANALYTIC TOOLS :

AN EXAMPLE FROM THE NETHERLANDS[1] — PUPILS

Analysis of Student Performance

THE PROBLEMS

1. Many pupils or students of all branches of education do not succeed in completing their studies, or at any rate incur a retardation of one or more years during the course of their education. The two problems broached here are :

- — the problem of non-completion of studies
- — the problem of retardation (repeating a class).

2. In the past, attempts have been made at obtaining an insight into these problems by means of traditional statistical observations, which always had the *grade* as a starting point. Thus, it was determined how many pupils per form were or were not promoted at the end of the school year. By applying the percentages of successive school years to the initial enrolment, overall study results could be roughly calculated.

3. Another traditional way of approaching these problems was to group the pupils of each grade by year of birth, in which case the years of birth of the pupils were considered as being indicative of their having passed through the school with or without retardation. On the basis of several years' data, calculations were made from them, for the purpose of obtaining an insight into study results.

4. These traditional statistics had their own significance but were not ideally suited for treating the problems indicated above. They could not give answers to questions such as :

a) How many pupils complete their studies in the *normal* time, i.e., without repeating a class ?
b) How many pupils complete their studies with some *retardation* and how long is this retardation ?
c) At *which stage* of a course of study is it prematurely stopped ? In particular, how great is the « drop-out » from grade to grade ?

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[1] This paper is a summary by the OECD Secretariat of the paper *Analysis of Student Performance*, published by The Netherlands Central Bureau of Statistics as No. 1 in its series on *Statistical Investigations on Education and Leisure* (The Hague 1965).

d) Which *factors* influence the duration of study (age of the pupil when admitted, social status, previous schooling, etc.) ?

5. The Netherlands Central Bureau of Statistics realised that such questions would never be answered with the aid of the usual statistics. The grade as a starting point is a heterogeneous mass, and moreover, no attention can be paid to the characteristics of each individual pupil.

6. The only satisfactory method would be to follow each pupil individually through his school career. The Bureau accepted this principle and chose it as the starting point for a number of studies on several branches of education.

7. It is evident that the problem outlined above is of far less significance in the case of the primary school, because all pupils are forced by the Compulsory Education Act to follow this education. Hence the Bureau concentrated its effort on various kinds of postprimary and university education.

COHORT

8. The cohort was taken over and over again as the starting point for the analysis. By cohort is understood : the group of pupils (in a branch of education) admitted to the lowest grade in the praticular branch of education, for the first time in the same school year.

9. Since 1930 many a cohort of pupils or students — notably those following voorbereidend hoger en middelbaar onderwijs (pre-university and general secondary education) and wetenschappelijk onderwijs (scientific education) — has been followed in its school career, so that comparison with older studies is possible.

10. The following study of school progress in voorbereidend hoger en middelbaar onderwijs (pre-university and general secondary education) will illustrate the use of individualised data for cohort analysis :

STUDY OF PUPILS' PROGRESS IN PRE-UNIVERSITY AND GENERAL SECONDARY EDUCATION

11. There are five main types of pre-university and general secondary schools[1]. They are the gymnasia (six-grade classical schools, with literary and scientific sections), hogereburgerscholen (five-grade general modern schools), lycea (combination of two previous types), middelbare scholen voor meisjes (five-grade general secondary non-classical girls' schools) and handelsdagscholen (commercial day schools).

METHODOLOGY

12. *Cohort.* Following the definition given earlier of a cohort, all pupils newly admitted in 1949 to the first grade of any of the schools mentioned above were included in the study.

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[1] Secondary evening schools are not included in this study.

13. *Data Collection.* Data were collected by means of individual data cards for each of the pupils covered by the study.

14. The data registered on each card may be broken down into two main groups :

a) Personal data on the pupil, which do not change with time[1].
   1. Surname and christian names.
   2. Sex.
   3. Date of birth.
   4. Occupation of father (as an indicator of social status).
   5. Previous schooling.
   6. The age and year pupil entered one of the above-mentioned schools.

b) Data concerning the pupil's progress in school.
   1. Kind of school (public or private).
   2. The grade and type of school and/or section of the pupil each year.
      — whether the pupil had or had not made adequate progress.
      — the type and address of new school attended by pupil.
      — whether or not the pupil passed the final examination and which certificate was obtained.
      — if the pupil does not proceed to any other educational establishment, his/her intended career. Here is a slightly modified (in the interests of simplicity) version of the card used for each pupil covered by this study.

CARD USED FOR RECORDING DATA ON INDIVIDUAL PUPILS

M
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F

Pupil number : ....
School letter and number : ....

1. School Career

Course Grade Section A or B (1)
49-50
50-51
51-52
52-53
53-54
54-55
55-56
56-57
57-58
58-59

(1) A = literary
B = scientific

1. Surname ....
2. Christian names ....
3. Date of birth .... 19...
4. Occupation of father ....
5. Kind of school ....
6. Admitted on .... 19... from (name and kind of school) ....
   Address ....
   The last completed grade there ....
   Admitted to grade ....
7. Left on .... 19... having made adequate/insufficient progress
8. Moved to (name and kind of school/course). Address .... at ....
9. Destination if no further education is followed ....
10. Did not pass the final examination in 19...; passed the final examination in 19...

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[1] Father's occupation may change with time, but as an indicator of social status, it is treated here as a constant.

The Selection of Factors to be Studied

15. The first « cohort » study of this kind was carried out in 1930. As no earlier studies existed, the choice of data (the « constant » factors) was still in an experimental stage. As studies accumulated, it became clear which factors were important, and which less so. Some data were left out, or replaced by others, in subsequent studies. The tabulation programme was also modified in the light of previous experience, and some compilations were omitted and new ones added, etc.

16. With each study, variations can be made in the factors to be correlated with pupil progress. For example, a regional breakdown can be made of the results, the data on kind of school can be omitted. While realising the advantages of this flexibility, it is not to be forgotten that a certain amount of continuity, for purposes of comparison, is very desirable. Another factor affecting comparability must be kept in mind, the need to maintain definitions constant. It would not be very helpful if the social status factor (father's occupation) were to be defined differently each time. Most of the data speak for themselves. Some of them will be explained below.

17. *Social Status (occupation of father)* : Occupations are classified into three main social groups : higher status, medium status, and lower status, the two latter groups being further broken down. The following is a short summary of the occupations included in each of these status groups.

Higher Status : Professors, teachers of secondary schools, officers of the armed forces, clergy, managers of limited liability companies, members of the judiciary, mayors, etc.

Medium Status : (salaried) : Medium-level clerical and technical personnel, medium-level personnel of the military and police forces, primary school teachers, etc. (Independent) : farmers and cultivators, heads of small enterprises, shopkeepers, traders, free professions (excluding education) : such as solicitors, bailiffs, etc. ; travelling salesmen, etc.

Lower Status : (clerical personnel) : Mainly junior-grade clerical personnel, lower ranks of the military and of government and municipal police forces, etc. (Manual workers) in industry and agriculture.

18. *Change of School* : Pupils moving from any of the schools mentioned earlier to any others in the group remain within the scope of the study (others are no longer followed) and hence must be localised. This is done in the following manner. Every new entrant into one of these schools is asked by the principal from which school he/she comes. If this happens to be another of the schools covered by the study, then the year of entry into the first grade of that school is ascertained. If the year happens to be 1949, the pupil has been « localised, » and the tracing of his school career can be continued. The old card of the pupil is found and used for this purpose.

19. *Kind of School.* A distinction is made between the following schools :

a) Government or municipality (public)
b) Protestant
c) Catholic (private)
d) Other

20. *Administrative Procedure.* The filling out and up-dating of cards is done by the school's administrations. This means that the central statistical authorities must re-sort the cards each year. Re-sorting is done according to the school from which cards come. There are three administrative stages that must be gone through :

a) *Advance Notice to Educational Establishments.* As, so far, these studies have not been carried out on a regular basis, every time it is intended to carry one out, schools must be informed. They are informed of the intention to collect information on those items, such as father's occupation, that are not asked for in regular statistical programmes.

b) *Filling Out the First Set of Cards.* This was done at the beginning of the school year, September, 1949-50, and finished at the end of 1949. (It is rare to admit new pupils after this date.) These cards are sent to the central statistical authorities and at this stage the « constant » data on pupils can be compiled.

c) *Annual Returning of Cards to the Schools.* Each successive year the cards are returned to the schools to be brought up to date on the prevailing situation in this case, as of December 31, 1950, 1951… etc., until the last pupil of the 1949 cohort had left the schools covered by the study. The cards of pupils having left school are no longer returned to the school to be updated.

As soon as the cards are received from the schools a second time, processing pupil progress in conjunction with the personal « consant » information can begin. It is now known how many members of the cohort were promoted, how many have to repeat the grade, how many drop out, etc. Each successive year more data on the progress of the cohort become available. Finally, approximately 10 years later, all members of the cohort have left these schools and the final results may be tabulated.

TABLE 1. SOCIAL STATUS AND AGE OF THE 1949 COHORT WHEN FIRST ADMITTED

Percentage.

SOCIAL STATUS (*Occupation of Father*)	BOYS (9,359)	GIRLS (5,693)	AGE WHEN ADMITTED	BOYS	GIRLS
Higher social status ..	25	36	11 years of age or younger.	3	3
Middle social status :			12 years of age............	34	42
Salaried	24	25	13 years of age............	43	41
Independent	28	24	14 years of age............	16	13
Lower social status :			15 years of age or older ...	4	2
Clerical Personnel..	6	5			
Manual Workers...	15	9			
Total[1]	100	100	Total	100	100

[1] Including 2 per cent unknown.

Results of the Study

21. The study of the school career of the 1949 cohort produced many interesting results. Here is a brief summary of some of them.

a) *The Factors that proved relevant.* It was shown that previous schooling and geographic distinctions were not very relevant, and hence, they are not treated in the information that follows. Two factors proved of exceptional significance, and they are considered in the enumeration of results. These factors are social status and age at which admitted to the secondary school.

b) *The* 1949 *Cohort.* 15,052 pupils (9,359 boys, 5,693 girls) entered the first grade of one of the schools referred to earlier, for the first time, in 1949.

With this background information, here are some selected tabulations on pupil performance.

TABLE 2. EDUCATIONAL RESULTS OF THE 1949 COHORT BY SEX
TOTAL V.H.M.O., PRE-UNIVERSITY AND GENERAL SECONDARY EDUCATION

Percentage.

EDUCATIONAL RESULTS	BOYS	GIRLS	TOTAL
Pupils who qualified :			
Without repeating grades	21	27	24
Having repeated grade(s)	31	26	29
Total	52	53	53
Pupils who did not qualify :			
Left having made adequate progress :			
from the 1st and 2nd grades	3	4	3
from the 3rd and higher grades	11	14	12
Total	14	18	15
Left having made insufficient progress :			
from the 1st grade	13	9	12
from the 2nd and 3rd grades	13	10	12
from the 4th and higher grades	7	9	8
Total	33	28	32
Total : Pupils who did not qualify	48	47	47

Comments. Nearly half the pupils, both boys and girls, do not complete their studies. Qualitatively, the performance of girls is somewhat better. They repeat grades less frequently and leave school less often when they have not made satisfactory progress.

TABLE 3. PUPILS OF THE 1949 COHORT WHO QUALIFIED, BY SOCIAL STATUS, AGE WHEN ADMITTED AND SEX

PERCENTAGE OF EACH SOCIAL GROUP, OR OF EACH AGE FOR TOTAL V.H.M.O.

PUPILS WHO QUALIFIED → SOCIAL STATUS AND AGE ↓	WITHOUT REPEATING GRADES		HAVING REPEATED GRADE(S)		TOTAL	
	BOYS	GIRLS	BOYS	GIRLS	BOYS	GIRLS
Social Status :						
Higher Status	21	29	40	32	61	61
Medium Status :						
Salaried	22	30	35	23	57	53
Independent	20	24	26	22	46	46
Lower Status :						
Clerical personnel	25	22	29	24	54	46
Manual Workers	22	26	23	16	45	43
Age when admitted :						
11 years of age and younger	33	39	48	38	81	77
12 years of age	37	32	29	32	66	64
13 years of age	20	23	29	25	49	48
14 years of age	12	18	21	13	33	32
15 years of age and older	9	10	9	8	18	18
Grand total	21	27	31	26	52	53

Comments. Pupils from more favourable social groups succeed more often, though this holds good mainly for pupils who succeed after repeating one or more grades. This shows clearly that pupils from the higher status group do not leave school when they have to repeat a grade, and it is this factor that contributes to the group's higher percentage of overall success.

TABLE 6. PUPILS OF THE [illegible] COHORT WHO DID NOT QUALIFY, BY SOCIAL STATUS, AGE WHEN ADMITTED AND SEX

Percentage

	SOCIAL STATUS				
	HIGHER STATUS	MEDIUM STATUS		LOWER STATUS	
		SALARIED	INDEPENDENT	[illegible]	MANUAL WORKERS
	BOYS				
Left school :					
having made adequate progress	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
having made insufficient progress	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Total	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
of whom :					
did not repeat grades	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
repeated grade/s	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	GIRLS				
Left school :					
having made adequate progress	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
having made insufficient progress	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Total	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
of whom :					
did not repeat grades	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
repeated grade/s	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

	AGE WHEN ADMITTED				
	10 YEARS OR YOUNGER	11 YEARS	12 YEARS	13 YEARS	14 YEARS OR OLDER
	BOYS				
Left school :					
having made adequate progress	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
having made insufficient progress	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Total	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
of whom :					
did not repeat grades	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
repeated grade/s	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	GIRLS				
Left school :					
having made adequate progress	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
having made insufficient progress	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Total	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
of whom :					
did not repeat grades	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
repeated grade/s	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

NOTE : Because of rounding, detailed items do not necessarily add to total.

Comments. On the whole, the percentage of persons who do not qualify is lower for the higher social group. Clerical personnel, in the lower status group fall between the salaried and independent middle status group. Girls leave more frequently when they are making satisfactory progress, but boys drop out far more frequently when they are not making satisfactory progress. The higher the age at entrance, the greater the tendency to drop out. This factor which is already very marked for pupils making satisfactory progress, is even more so, for those who have not made satisfactory progress.

TABLE 5. COMPARISON OF PUPIL PERFORMANCE OF THE 1931, 1946 AND 1949 COHORTS, BY SEX

TOTAL V.H.M.O.

Percentage.

	WITHOUT REPEATING GRADES			HAVING REPEATED GRADES			TOTAL		
	1931	1946	1949	1931	1946	1949	1931	1946	1949
					BOYS				
Pupils who qualified	21	20	21	32	28	31	53	49	52
Pupils who did not qualify	21	19	18	26	33	30	47	51	48
Total	42	39	39	58	61	61	100	100	100
					GIRLS				
Pupils who qualified	22	24	27	23	23	26	45	48	53
Pupils who did not qualify	32	26	22	23	27	25	55	52	47
Total	54	51	49	46	49	51	100	100	100
					TOTAL				
Pupils who qualified	22	22	24	29	26	29	51	48	53
Pupils who did not qualify	24	21	19	25	31	28	49	52	47
Total	46	43	43	54	57	57	100	100	100

Comments. Whereas there has been some fluctuation in the performances of boys in the three periods studied, the performance of girls has steadily improved. This is due to the development of secondary education for girls.

This table illustrates how individualised data may be used, in conjunction with cohort analysis, to make comparisons over time, in this case of pupil performance.

TABLE 6. PERCENTAGE OF PUPILS OF 1960 COHORT WHO QUALIFIED, AND THOSE WHO DID NOT QUALIFY BY GRADE OF DROP-OUT, AND SEX

TOTAL U.N.R.W.A.

Percentage.

	BOYS		GIRLS		TOTAL	
	TOTAL	*of whom:* THOSE WHO MADE INSUFFICIENT PROGRESS OR WERE RETARDED	TOTAL	*of whom:* THOSE WHO MADE INSUFFICIENT PROGRESS OR WERE RETARDED	TOTAL	*of whom:* THOSE WHO MADE INSUFFICIENT PROGRESS OR WERE RETARDED
Pupils who qualified	52	31	53	26	53	29
Drop-outs from:						
first grade	15	14	11	10	13	12
second grade	10	9	7	6	9	8
third grade	15	13	17	12	16	13
fourth grade	6	6	7	5	6	6
fifth grade	2	2	4	4	3	3
sixth grade	0	0	1	1	0	0
Total	48	44	47	38	47	42
Grand Total	100	75	100	64	100	71

Comments. The first and third grades appear to be the greatest stumbling blocks. Repetition of a grade or unsatisfactory performance seem to be the major contributory factors of all pupils who do not pass the final examination (47 per cent) only 5 per cent have not had to repeat a grade or have made satisfactory progress all along the line.

Annex III

THE USE OF INDIVIDUALISED DATA AS AN ANALYTIC TOOL

Examples From The Netherlands Teachers

This annex presents a survey of the use of individualised data for teacher statistics in the Netherlands. After a methodological introduction, two practical applications are described.

I. Methodology

Drawbacks of collective data

1. The use of traditional collective data — e.g. the number of teachers per school — is based on the principle that each school carry out a small statistical survey of its own personnel, and the responsible Statistical Authorities aggregate these data for the entire country. This method has several drawbacks:

- *i)* In many branches of postprimary education the total of the data aggregated for each school includes double counting, as in many cases a teacher teaches in two or more schools. In fact the number of teaching positions is counted. Only by means of co-ordinating examinations is it possible to obtain the total number necessary, since manpower studies must deal with the supply and demand of individual persons.
- *ii)* The statistical results obtained in this way are necessarily simple: school administrations can only make a few simple differentiations, such as a breakdown of teaching personnel by sex. At best, a particular personal characteristic such as age may be added. But the kind of information required for manpower studies, e.g. qualifications by sex and age-group, cannot be obtained through this type of administrative reporting.
- *iii)* Collecting statistics in this manner does not allow for a flexible tabulation programme, as only data requested in the questionnaire are available for compilation.
- *iv)* Aggregates of data per school can only supply totals of stocks. Stocks, however, are the result of a number of flows in the course of time. Well-founded manpower studies need data on stocks as well as data on flows, for it is important to know the factors contributing to changes in stocks.

c) The method of simply summing the aggregate data per school can hardly meet the demand for flow-data. For administrative reasons questions about numbers of newly appointed and departing teachers must be very simple. If school administrations are to supply essential information such as whether a newly appointed teacher came from another school (of the same type) or from outside the type of school under discussion, this itself limits the possibilities of asking for further information, as this already means an extra characteristic has been added to the basic stock data. This holds good for departing teachers also.

Advantages of individualised data

2. The difficulties mentioned above can be removed by asking the schools to supply individual data concerning each teacher: name, sex, year of birth, number of lesson periods taught per week per subject, qualifications, etc.

3. Individualised data have the following advantages:

- *i)* The annoying double counting within a branch of education can now be eliminated, and numbers of teachers can be counted instead of numbers of teaching positions.
- *ii)* Personal data per teacher can be combined at will, and in this way, through greater flexibility or tabulation possibilities, statistical insight can be deepened considerably.
- *iii)* This means that given the much greater freedom of processing, it is not necessary to draw up an a priori fixed scheme of data combinations. Data can be used to draw up various types of tabulations at a later date.
- *iv)* School administrations can produce nominative lists[1] showing the teachers of the school without great difficulty. In addition, this basic information has been found to be more reliable in the Netherlands.
- *v)* The data may be processed in such a way that information on

of a survey of the total number of teachers [illegible] the same stock for the previous years, the net result of the flows can be ascertained, but no details are available of the magnitude of its component parts. These magnitudes are obtainable from the flow compilations.

Nominative lists per school

4. The individualised data form part of the information obtained from the questionnaires that are filled out by the schools. The reader will find part of such a nominative list[1] dealing with a primary school in the illustration diagram.

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[1] The lists are called «nominative» because identification of the same individual over time is effected by identifying teachers having the same name. Information is classified by name. Other methods of identifying individuals are discussed in Annex III.

No central card-register

5. By means of the individual data it would be possible to build up a central register of all teachers that could be brought up-to-date by the school administrations annually. In principle this could cover the entire Dutch educational system. There are, however, objections to the introduction of a central register :

- *i)* The introduction and maintenance of an up-to-date central register is expensive.
- *ii)* A central register implies that all compilations — complicated or not — must be made annually for all types of education, or that at any rate that it must be possible to make them every year. Experience has shown, however, that changes in the components of the teaching staff from year to year are often small. Therefore, in most cases, one investigation every two or three years, is sufficient.

6. Hence it may be concluded that, for the Netherlands, a central register is very expensive to run in relation to the benefits that can be drawn from it.

The necessity of individual cards

7. The nominative lists with individual data can be used directly for simple adding up of totals, in the case of types of schools where teachers have full-time jobs, so that « position » is identical with « teacher. » In general, this is the case with nursery and primary schools. For other types of schools — where a teacher sometimes is at two or more schools — it is necessary, however, to make individual cards with the data of these nominative lists, so that double counting can be eliminated, and a total of teachers, rather than teaching positions be obtained.

III. Examples of use of individualised data

8. As an illustration of the methodological points given above, here are two examples of actual application[1] :

1. A description of a study of demand and supply of teachers in primary education, and
2. a description of a study of shortages of qualified teachers in secondary grammar schools.

IIIa. *Example 1* : Statistics on Demand and Supply of Teachers in Primary Education

Sources. The basic material is obtained from answers to questionnaires filled out annually (situation on 16th January) by the schools. This includes :

— a nominative list of the teaching staff showing a number of personal data (see the illustrative diagram on page 250) ;

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[1] Since this paper is primarily concerned with the methodology of the use of individualised data, the description of examples is not burdened with all kinds of details that might easily obscure insight into this methodology. For the same reason, the types of schools and institutions are only summarily described.

EXAMPLE OF NOMINATIVE LIST OF TEACHERS IN A SCHOOL

Head and class-teachers in primary schools on January 15th, 1963

(Condensed version)

NUMBER	NAME¹	DATE AND YEAR OF BIRTH	SEX	MARITAL STATUS	[illegible]	OTHER CERTIFICATES OR QUALIFICATIONS										[illegible] (3)	[illegible]
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Head - teacher :																	
1																	
Class - teachers :																	
2																	
3																	
4																	
5																	
etc.																	

1. For married women, maiden name also.
2. E.g. permanent, temporary, deputy for ill teacher, etc.
3. Whether salary is paid by Central Government, Community or Schoolboard.

— a report on the number of vacancies;
— the destination of teachers who left the school during the preceding year;
— origin of teachers appointed to the school during the preceding year.

By comparing the names on the nominative lists of the same school in two successive years it is possible to establish accurately:

— which teachers left the school during the year between the two dates;
— which teachers were appointed during the same period.

« Change » cards. For each change (movement) found in this way a card is made. This is an appointment-card or a departure-card. Each card contains the following information about the teacher concerned[1]:

— name and initials;
— sex;
— year of birth.

Method of processing. All *change* cards are put in alphabetical-lexicographical order. When for one and the same teacher two cards are found (one of departure, one of appointment) then it is certain that this teacher has merely moved to another school of the same type, and has remained a teacher in that particular type of school — in this case the primary school. When these cards have been discarded two groups remain:

— those of the teachers who have left primary education;
— those of the teachers who were newly appointed from outside primary education.

Demand and supply. Before the results of this investigation are given, some concepts must be defined:

1. *Demand.* Under « demand » for teachers is to be understood the total of the following three elements:

a) the number of unfilled vacancies on 16th January of the year A, being the first of the two successive years for which data have been compared;
b) replacement: the number of teachers needed to take the places of those teachers on 16th January of the year A, who were no longer there on 16th January of the year A + 1 (retirement, death, movement to work outside primary education, etc.)[2];
c) extension (which may be positive or negative), i.e. the change in total number of available full-time positions[3].

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[1] Only the basic data are mentioned here. Supplementary information on supply and demand of teachers is obtained by means of the following data:
— kind of appointment (permanent, temporary, deputy for ill teacher, etc.)
— where did he go, or from where did he come?

[2] Changes not mentioned in the questionnaire are not taken into account, e.g. teachers who are newly appointed after 16th January of the year A who leave primary education before 16th January of the year A + 1.

[3] Extension can be calculated as follows:
a = number of teachers + number of vacancies on 16th January of the year A;
b = number of teachers + number of vacancies on 16th January of the year A + 1;
b — a = extension, which may be either positive or negative.

2. *Supply.* Supply is defined as : the number of teachers appointed between 16th January of the year A and 16th January of the year A + 1, who come from outside primary education.

APPLICATION OF THESE DATA

1. *Replacement* (see previous paragraph under 1 *b*)) is expressed as a percentage of teachers (head-teachers included) on 16th January of the year A. This is justified by experience, which shows that the replacement-percentage changes little from year to year, so that this can be used as a coefficient for replacement in forecasts.

2. *Extension* (see previous paragraph under 1 *c*)) is, or at any rate can be, subject to much greater changes. Therefore it is not opportune to express extension as a percentage of total number of teachers. This percentage — or an average of percentage — can not be used as a coefficient in forecasts. Therefore extension is best expressed in absolute numbers.

Forecasts. If forecasts for a series of years of numbers of pupils are divided by a given pupil/teacher ratio, the number of teachers required to fill all available teaching positions each year is obtained.

Suppose this calculation has led to the following requirements of teachers :

in the year A .... B_0
in the year A + 1 .... B_1
in the year A + 2 .... B_2

and the established replacement-percentages averages per cent annually, then the need for new teachers (the sum of extension and replacement) in the year A + 1 can be expressed by the following formula :

$$(B_1 - B_0) + \frac{pB_0}{100}$$

Results

TABLE 1

1. REPLACEMENT IN PRIMARY SCHOOLS 16th JANUARY 1962 TO 16th JANUARY 1963

REASON OF REPLACEMENT	ABSOLUTE NUMBERS	AS PERCENTAGE OF NUMBER OF TEACHERS ON 16th JANUARY 1962
a) Leaving primary school as class-teacher	3,900	9.6
b) Appointment to position other than class-teacher[1]	700	1.7
Total	4,600	11.3

[1] As special subject-teacher, deputy for ill teacher, etc.

TABLE 2

2. TOTAL DEMAND FOR TEACHERS IN PRIMARY SCHOOLS 17th JANUARY 1962 TO 16th JANUARY 1963

REASON FOR DEMAND	ABSOLUTE NUMBERS	PERCENTAGES
a) Number of unfilled vacancies on January 16, 1962	197	3.3
b) Replacement	4,666	88.0
c) Extension of the number of full-time positions	473	8.7
Total demand for new teachers	5,336	100.0

TABLE 3

3. DESTINATION OF TEACHERS LEAVING PRIMARY EDUCATION DURING THE PERIOD 17th JANUARY 1962 TO 16th JANUARY 1963

DESTINATION	ABSOLUTE NUMBERS			PERCENTAGES		
	M.	F.	TOTAL	M.	F.	TOTAL
Retirements	310	362	672	17.0	9.2	11.5
Marriage[1]	—	2,392	2,392	—	60.0	40.9
Death	20	50	60	1.1	1.2	1.0
Appointment to position other than class teacher[2]	222	488	710	12.0	12.7	12.1
Transfer to another type of school	892	599	1,491	49.0	15.0	25.7
Appointment outside education	59	117	176	3.3	3.1	3.0
Other reasons	302	182	487	16.7	6.7	8.3
Total	1,823	3,998	5,821	100.0	100.0	100.0

1. Including those who married earlier and who returned to their households.
2. See note 1 to table 1.

TABLE 4

4. PREVIOUS POSITION OR OCCUPATION OF TEACHERS NEWLY APPOINTED TO PRIMARY SCHOOLS BETWEEN 17th JANUARY 1962 AND 16th JANUARY 1963, FOR THOSE TEACHERS COMING FROM OUTSIDE PRIMARY EDUCATION

COMING FROM :	ABSOLUTE NUMBERS			PERCENTAGES		
	M.	F.	TOTAL	M.	F.	TOTAL
Teacher training schools	731	1,983	2,714	57.6	65.0	62.3
Primary school (but as deputy or as special subject teacher)[1]	209	406	615	16.5	13.3	14.0
Other type of school	109	117	226	8.6	3.8	5.2
Military service	156	—	156	12.3	—	3.6
Household	—	291	291	—	10.2	6.6
Other	73	159	232	5.8	5.5	5.3
Total	1,268	3,046	4,362	100.0	100.0	100.0

1. See note 1 of table 1.

Tables 1 and 2 contain the basic data supplied by the investigation. It goes without saying that more detailed information is available. It is important to know where the new teachers came from and where the departing teachers went. Some examples can be found in tables 3 and 4.

III. *Example 2* : THE SHORTAGE OF QUALIFIED TEACHERS IN SECONDARY GRAMMAR SCHOOLS

The problem. The Netherlands, like so many other countries, is up against a shortage of teachers in several types of postprimary education. Here, an analysis of this shortage in secondary grammar schools will be made. (Abbreviated in Dutch : V.h.m.o.[1]). This education follows the primary school, and in courses of 5 or 6 grades mainly prepares pupils for university education[2]. For this analysis data relating to the situation in 1964 and 1965[3] are used.

A shortage of qualified teachers has arisen because in the last two decades, as a consequence of demographic influences in combination with a relatively high increase in attendance at this type of school, the number of pupils at v.h.m.o. has greatly increased. In 1950 there were just over 86,000 pupils, in 1965 just over 213,000, an increase of 150 per cent. There was not, of course, immediately, an adequate supply of new teachers available to meet the highly increased demand which this growth implied, but it did prompt many students into choosing those fields of study, which could lead to careers as secondary school teachers.

Such education is, on the one hand, university education[4] and on the other, part-time training courses at non-university level, where secondary school teachers are also trained. (The so-called 'M.O.-certificates'[5].) It is obvious that the higher admission rate to secondary teachers' training institutions has its effects only 4 to 8 years later.

The large increase in numbers of pupils at v.h.m.o., has, however, decelerated during the last few years. Given the fact that at the same time, numbers of graduates were still increasing — both in university education and in the part-time training courses — a strong decrease in the shortage of qualified teachers at v.h.m.o. might have been expected. The expected decrease in the shortage was not forthcoming : the percentage of unqualified lesson periods[6] in obligatory subjects[7] only decreased from 23.8 per cent to 23.3 % between 1964 and 1965.

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[1] For a description of the schools covered, see paragraph 11 of Annex I.

[2] The study is restricted to full-time education. Commercial evening schools and some other types of part-time secondary grammar schools have been excluded.

[3] Data relating to the situation on 15th September 1964 and 1965 are compared. For short, these time periods will be indicated as 1964 and 1965 in what follows.

[4] Most university faculties have an intermediate and a final examination. Only persons having passed the final examination are considered qualified teachers.

[5] In the case of M.O.-certificates there are also usually two types, the intermediate and the final certificate. Only those possessing the final certificate are qualified teachers. In what follows « M.O.-certificate » always means « Final » M.O.-certificate.

[6] Number of lesson periods taken by unqualified teachers is the most adequate unit of measure.

[7] Non-obligatory subjects are not covered by the investigation.

Basis of Statistical Analysis

The fact that the above mentioned *reasonable* expectation was not justified brought about the necessity for a statistical analytical study of the reasons for this. The obvious difference between the total numbers of qualified teachers in two successive years — in this case the years 1966 and 1967 — gives insufficient insight. For, as has been explained before in the methodological observations in this annex, it gives only the final result of the factors that cause the changes. It is necessary to study and establish each of these components separately.

To prevent unnecessary complications in the example used to demonstrate the use of individualized data on teachers, a subject-by-subject treatment — with the specific problems of double counting, e.g. between teachers who are listed as being teachers of both mathematics and physics — has been left out. The discussion is restricted to totals.

Three flows can be distinguished with regard to qualified teachers:

a) *Appointment*: Teachers who come from outside the V.H.M.O. and already possess a qualifying degree or certificate;

b) *Departure*: The teachers who leave the V.H.M.O. because of retirement, death, job outside V.H.M.O., etc. They too possess the required degree or certificate;

c) *Unqualified teachers who become qualified*. These are teachers who in 1966 were unqualified. In 1967 they are qualified, which means that while practising as teachers they passed their qualifying examinations.

The flows which influence the proportion of qualified teachers can now be summarized as follows:

Total of qualified teachers 1967 = (Total of qualified teachers 1966) + (Appointed qualified teachers) — (Qualified teachers who left) + (unqualified teachers who obtained qualification during the year).

University-trained or with M.O.-Certificate

Before the analysis of the shortage of qualified teachers is started by means of factual statistical results, a second problem will be added. It has been explained earlier, that teachers in the V.H.M.O. can either be university-trained or have an M.O.-certificate. Although the qualifications and the salaries are the same for both, it is considered desirable for educational reasons that the proportion of university-trained teachers increase. It is important, therefore, to establish the relative share of, and the moves between these two categories. As it is extremely rare that a person with an M.O.-certificate continue his studies at a university, the extended problem now consists in fact of six flows: appointment-departure — obtaining qualification on the one hand, and a distinction between university-trained and those with the M.O.-certificate on the other.

Methods of Collecting and Processing the Data

After the above outline of the problem it will be clear that individualized data are the only means to obtain the required information. The Central Bureau of Statistics, by means of annual questionnaires, has the following individual data about teachers in V.H.M.O.:

— name, sex, year of birth and marital status;
— initial year of appointment at the v.h.m.o.;
— kind of appointment (permanent or temporary);
— kind of qualification (university degree or M.O.-certificate, by subject);
— subjects taught and number of weekly lesson-periods for each subject.

These data are filled out on an index card and — by putting these in alphabetical order — positions of teachers at more than one school can be combined to give one total.

In the first place, it is now possible to establish for each teacher:

a) Whether or not he is qualified. This is done with the help of the data on degrees and certificates[1];
b) Whether he has a university degree, an M.O.-certificate or another qualification (this applies especially to former military officers).

By comparison with the cards of the preceding year[2] the following groups of teachers can be established:

a) The qualified teachers appointed since [illegible].
b) The qualified teachers who have left the v.h.m.o. during the year.
c) The unqualified teachers who obtained a qualification during the year.

Results. In the following table the discussed flows are shown.

TABLE 6. NEWLY APPOINTED, DEPARTING AND UNQUALIFIED TEACHERS BECOMING QUALIFIED AT THE V.H.M.O., DURING THE PERIOD 15th SEPTEMBER [illegible] – 15th SEPTEMBER [illegible]

TEACHERS AT V.H.M.O.	QUALIFIED TEACHERS				UNQUALIFIED TEACHERS
	TOTAL	UNIVERSITY DEGREE HOLDERS	M.O. CERTIFICATE HOLDERS	OTHER QUALIFICATIONS	
Total — 15.9.[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Newly Appointed	+ [illegible]	+ [illegible]	+ [illegible]	+ [illegible]	+ [illegible]
Left	— [illegible]	— [illegible]	— [illegible]	— [illegible]	— [illegible]
Net Inflow	+ [illegible]	— [illegible]	+ [illegible]	+ [illegible]	+ [illegible]
Obtained a qualification during year	+ [illegible]	+ [illegible]	+ [illegible]	+ [illegible]	— [illegible]
Additions	+ [illegible]	+ [illegible]	+ [illegible]	+ [illegible]	+ [illegible]
Total — 15.9.[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

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[1] When a teacher is qualified for one subject but not qualified for the other subject(s) he teaches, in this study he is considered qualified, if he is qualified for at least [illegible] of his weekly number of lesson-periods.

[2] Note that teacher-cards have been made for [illegible] as well as for [illegible].

These results lead to the following conclusions :

1. *Qualified — unqualified*

   a) Although the number of newly appointed qualified teachers is rather high, its incidence on the change in total stock is reduced considerably by the high number of leavers. The net balance of qualified newly appointed and departing teachers contributes relatively little to the additions of qualified teachers, being 31 per cent.
   b) Teachers obtaining a qualification during the course of the year is the most important factor in the improvement of the proportion of qualified teachers : 69 per cent. The number of (unqualified) teachers obtaining a qualification is 11 per cent of the total number of unqualified teachers in 1964.
   c) The number of unqualified teachers increased by 5.1 per cent during the year 1964/65. The factors « becoming qualified, » leaving and appointment were in the proportion of 1.0 to 1.2 to 1.7.

2. *University degree and M.O.-certificate*

The proportion of total qualified teachers with a university degree decreased from 1964 to 1965 : (1964 : 52.6 per cent, 1965 : 51.2 per cent). This was caused by a lower — even negative — balance of appointment and leaving among university-trained teachers, as well as by the (absolute and relatively) smaller group that obtained a university qualification.

Full-time teachers

The high number of departing qualified teachers leads to a demand for data on the *destination* of the leavers. It should be realized, that many teachers hold part-time positions only, at the v.h.m.o. Therefore a distinction, based on the numbers of weekly lesson periods, was made between :

a) Teachers taking 20 or more lesson periods weekly, including headmasters and deputy headmasters (irrespective of their number of lesson periods). All these teachers can be considered full-time teachers. They make up 43 per cent of all qualified teachers.
b) Teachers taking less than 20 lesson periods weekly : part-time teachers. They make up 57 per cent of the qualified teaching force.

Our further analysis will deal with *full-time* teachers only.

The proportion of university-trained teachers, of all qualified teachers who left v.h.m.o. in 1964, turned out to be higher (57 per cent) than for other groups (M.O.-certificate 41 per cent, other 2 per cent).

Thanks to a separate question on the destination of qualified leavers — for each individual teacher — the analysis could be continued. It produced the following results :

a) Many teachers stay at the v.h.m.o. for a short time only : on the one hand 42 per cent of the leavers were under 40 years of age, and on the other for approximately 37 per cent of the leavers, a period of only 7 years or less had elapsed since the passing of the final (*i.e.* qualifying) examination.

b) Excluding retirement, deaths and departure due to marriage of female teachers (together 61 per cent), appointments to university education (member of the scientific staff, professor, etc., 16 per cent) and non-teaching jobs (outside education, 12 per cent) are the main reasons for leaving.

New appointments

Arguing along the same lines as in the case of leavers — less than 20 lesson periods weekly or 20 and more lesson periods weekly — it was established that 46 per cent of newly appointed teachers could be considered full-time teachers, and 54 per cent part-time. Of the full-time teachers, 42 per cent had a university degree and 51 per cent an M.O.-certificate (plus 7 per cent « Other »).

Comparison of New Appointments and Departures

In comparing appointments (+ 326) and departures (— 267) of full-time teachers in the periods 1964-1965, the small positive balance (+ 59) is conspicuous.

Interest in the teaching profession

Methodology. The last point dealt with here is : How many of those who recently passed a final examination want to be teachers at the v.h.m.o. ? In this case too, individualized data could solve the problem.

The sources were :

a) Individual data on those who passed a final university examination or an M.O.-examination : Name, sex, year of birth, and year when qualifying examination was passed[1] ;

b) Individual data on teachers at the v.h.m.o., with special attention being paid to the year of first appointment at the v.h.m.o.

By comparing these two card-registers[2], the number of persons who passed their final examinations in the period 1959-1962 and were also teachers at the v.h.m.o. in 1964 could be found. The time-lag of two years is chosen to take account of obligatory military service.

As the results differ widely for differing fields of specialisation, grand totals have not been calculated, either for university-trained teachers or for those with an M.O.-certificate.

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[1] For each person who passed a final university examination or M.O.-examination, a personal card is made up. This is a permanent record, for which nominative lists of examinations passed serve as basis.

[2] I.e., the cards of the teachers at the v.h.m.o. in 1964 and the cards for the period 1959-1962.

Results

TABLE 6. DATA FOR MALE TEACHERS BY FIELD OF SPECIALISATION

SUBJECT	OF THOSE WHO PASSED FINAL EXAMINATION IN 59/62, WERE TEACHING AT THE V.H.M.O. IN 1963	
	UNIVERSITY DEGREE	M.O. CERTIFICATE
French	70 %	91 %
Geography	66 %	78 %
Dutch	62 %	70 %
Mathematics	38 %	57 %
Chemistry	33 %	[1]
Physics	23 %	[1]

[1] It has not been possible to obtain a final M.O. certificate in these subjects until very recently. For this reason no percentages have been calculated.

CONCLUSIONS

1. The interest in a position as teacher at the v.h.m.o. differs widely according to field of specialisation.
2. The variation in these percentages is much greater among university-trained teachers than among those who have an M.O. certificate.
3. The percentage of persons who obtained M.O. certificates and who became teachers is in all measured fields (in some cases considerably), higher than the corresponding number of university graduates who became teachers.

This paper should give some idea of how much more intricate the analysis of educational problems can become with the use of even the most elementary individualised data systems.

Annex III

ORGANISATIONAL AND TECHNICAL ASPECTS OF THE INTRODUCTION OF INDIVIDUALISED DATA FOR GERMAN UNIVERSITY STATISTICS[1]

1. Educational Statistics, are in the first instance the responsibility of the « Laender » (States), and then of the Federal Statistical Authorities. This means that school statistics presented for the entire Federal Republic can only cover elements common to the statistical programmes of each of the States. The Federal Authorities are now responsible for coordination of the educational statistics' programmes of the States, thus ensuring a minimum uniform collection of data in all States, including the reporting of results of certain surveys described below. In the case of new topics to be included in the programme, the Federal Statistical Office prepares surveys with regard to methodology, drafts questionnaires, determines the final version of questionnaires, and then prepares the material needed for the evaluation of the results. It then provides the Land Statistical Offices with the forms they need in order to report the results of the surveys. The Federal Statistical Office aggregates Land statistics for the whole country and publishes them.

Existing University Statistics in Germany

2. German universities operate on the basis of two semesters annually.

3. Since the summer semester of 1949, so-called « minor statistics » relating to institutions of higher education have been collected. These are statistics compiled from information in the possession of university administrations.

4. Since the following semester, so-called « major statistics » on institutions of higher education have been compiled and published annually. (Except winter 1956/57.) These statistics derive from answers to questionnaires filled out by students. The questionnaires are processed by the Land Statistical Offices, and aggregated for the entire country at the Federal Statistical Office.

5. The coverage of these statistics has been improving constantly.

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[1] This is a summary by the OECD Secretariat of a paper submitted to the Secretariat by Dr. H. Kullmer and Dr. H. Zindler of the Statistisches Bundesamt, Wiesbaden, Germany on *Administrative and Technical Problems Arising out of the Conversion of German University Statistics from Stock to Flow Statistics* (April 1965).

The Deficiencies of the Statistics, and the Need for Change

6. So far, the only available statistics are stock statistics. The stocks do not provide information on progress of students, drop-out rates, movement from one university to another, from one field of study to another, or the duration of study. It would be of great interest to correlate drop-outs with field of study, sex, age, marital status, etc. This type of information is essential to the rational planning of new universities, studying problems of location of institutions, the capacity requirements of universities, and many other related problems. Without this information, rational costing and estimating of financial needs is very difficult indeed. Given the German University system (which will be described briefly below), a simple cohort analysis would not be sufficient. In the German University system, a student may change his field of study, the department of study, or even university, each semester. He may also interrupt his studies, and this has led to some awareness recently of the problem of the duration of studies. A student may drop out without notification to authorities, or register and take the final examinations without ever being present at lectures or seminars. This freedom for the student creates many a headache for the educational statistician, for it is very difficult to trace students, and to relate the stock figures for one semester, to the stock figures for another.

7. During recent years the demand for more detailed information than can be supplied by the current stock statistics has continued to grow. In February 1967, the Conference of Ministers of Education of the Laender adopted a proposal which provides for computer processing twice a year (each semester) of the « Major Statistics » (those obtained through replies to questionnaires) by each of the Laender. Duplicates of the punch cards are sent to the Federal Statistical Office, where the information is transferred to magnetic tape.

8. The main purpose of this programme is to make a start with the collection of flow statistics. The flow statistics will be derived by making comparisons between semesters. This presupposes some way of identifying each student, and then tracing his educational movements each semester.

9. Before dealing with the specifically technical problems involved in setting up a workable system, here is a brief account of how the collection takes place.

Collection of Data

10. Students fill out a questionnaire at the beginning of each semester. They fill out one of two kinds of questionnaire :

a) Questionnaire for newly enrolled students. This contains all the basic information which need be obtained once only, such as age, sex, father's occupation, previous education, etc. It is necessary to consider these questions with great care both as to content and drafting, as programming costs are very high. It is hoped that it will not be necessary to change the characteristics studied, at least in the medium term.

b) Once the results of the questionnaires for newly registered persons are available, all questions which are not subject to change can be dispensed with. The second questionnaire would thus be less voluminous, and require less checking and processing. It is also being considered whether this questionnaire could not be drafted in such a way that certain characteristics can be automatically coded by the student, from the given instructions. This would reduce coding work at the Land Statistical Offices considerably. The use of automatic reading devices is also being considered. These topics are dealt with in greater detail in the technical section of the paper.

11. During the 1965/66 winter semester, retrospective questioning was used to obtain partial information on the movement of students between branches of study, universities, the duration of study, etc. This is a stop-gap measure which will be discontinued when the individualized data system has become fully operational.

PROCESSING OF DATA

12. Because of the federal institutions of Germany, data will continue to be coded and punched at the Land Statistical Offices. Duplicates of punch cards or magnetic tapes will be passed in to the Federal Statistics Office, where national tables will be compiled. Programming considerations will probably dictate the form in which tables will be presented, and it is likely that for most tables the columns will show branch of study, and the rows the combination of characteristics to be crosstabulated with branch of study. For the remaining tables, the columns will show years of birth, and the rows, the required combination of characteristics. At specific intervals (still to be decided at the time of writing) the information stored on tapes will be used to provide data on student progress. These tables will indicate how often students changed universities or branch of study, after how long such changes took place, when, why, how often, and for how long studies were interrupted, etc. Drop-out rates will be calculated each semester. By use of the identification number, enrolments can be compared from one semester to another. To maintain the master file so that this can be done each semester, requires up-dating each semester. The master-file must be adjusted every six months to include information on newly enrolled students. Before the final processing of details on drop-outs, the identification numbers of those students found to be « missing », must be passed on to the relevant university administrations via the Land Statistical Offices. The university administrations will be responsible for supplying information on reason of drop-out, or whether there has been an error. (Problems of error will be discussed later.) There are a large number of uses to which this information can be put. It is not difficult to see the relevance of « drop-out » rates to educational policy and finance.

13. What technical problems have to be faced before these very sophisticated statistics become available ? To answer this question, it is perhaps advisable to ask another. How can modern electronic computers make the enormous amount of manual clerical and compiling work manageable ? It seems fairly clear that it is unlikely that programmes as ambitious as this one could be carried out without the aid of high speed electronic computers. As the state of knowledge in the field of computers is moving rapidly, it should be borne in mind that the following information is valid as of 1966.

Some of the problems to be mentioned may be far more easily soluble in the future, with further developments.

14. The problems arising out of the collection of flow statistics with the aid of electronic computers will be dealt with under two main headings:

1. Questionnaire design and transfer of information to punch cards, and on to magnetic tape.
2. Maintenance of file, and processing and tabulation of data.

1. *Questionnaire design and transfer of information to punch cards, and on to magnetic tape*

15. In order to establish university flow statistics, every student registered at a German university is required to fill in a questionnaire, which is to be punched at the Land Statistical Offices; the punch cards thus obtained will then be processed centrally at the Federal Statistical Office.

16. Since data are available for just one semester at a time, statistics on the progress of studies can be compiled only if a central file of all students is kept, in which all relevant information about each student is recorded.

17. As already mentioned, different questionnaires are used for newly enrolled students, continuers and other students. Different punch cards are produced for each of these groups, and it is expected that two cards will be required for each questionnaire.

18. It is evident that in statistical processing any manual work that can be taken over by machine will save time and money. If the manual punching of 800,000 cards twice a year can be avoided the gain is clear. The use of automatic reading devices for reading the answers directly off the questionnaires by machine would do just this. The Statistical Authorities consider that prior to every statistical survey, it should be determined whether use can be made of automatic reading devices. The safest method of reading by machine is at present the mark-sensing procedure which is performed on an optical basis. Machine processing of questionnaires requires certain standards with regard to format and content of questionnaires. These standards depend largely on the particularities of the specific reading device used. There are a number of different machines available for this purpose. During a follow-up survey to the Microcensus, the Federal Statistical Office acquired first hand experience with an IBM 1232. The test may be regarded a success, and for this reason it is being considered whether the mark-sensing technique can also be used for statistics of institutions of higher education.

19. First of all, here are some of the specifications of the IBM 1232. The device handles markings on documents having the size of about DIN A 4 and produces punch cards. The working speed ranges, according to the amount of data contained on a document, from 1,000 to 2,000 documents per hour and thus does the work of 4 to 5 punchers. The machine can easily be operated by one person. It is relatively cheap: rental of somewhat over DM 2,000 a month, at time of writing.

20. A document can contain up to 1000 markings (possibilities of

answers), but these markings can appear only in precisely defined places on the document to be read, and other conditions must also be strictly satisfied. If — as is the practice in statistical surveys — the form is to contain the text of questions and instructions for filling out the form, marking possibilities are lost. Further constraints are introduced by reading and checking techniques. Therefore, it is necessary in each individual case of application to effect a careful analysis of the structure of the questionnaire both with regard to its clarity and the technical aspects involved. This presupposes that the coverage and tabulation programmes are exactly laid down before the drafting of the questionnaire can actually begin, and before a decision concerning the technical practicability of automatic reading can be made. Any extension of the catalogue of questions complicates the lay-out of the questionnaire considerably and affects its clearness. Though this fact applies to the design of questionnaires for all statistical studies, it becomes particularly significant here because of the machine requirements.

21. As far as the technique of entries (answering the questions) is concerned, the method of marking used (horizontal dashes to be made between two subsidiary lines) is generally easily understood. The instruction is « mark the proper answer ». There are, though, certain difficulties with characteristics which have multi-digit keys. The dashes must be made with a black pencil; a ball pen or coloured pencil is not sufficient. There are, however, rather few requirements with regard to the exactitude of the marking. A dash must cover only a certain part of the area provided, and may well go beyond the delimiting lines. It is possible to combine on a given questionnaire answers in « marking » and others, but it is obvious that only the former can be immediately « read » by the machine.

22. The question is whether this technique can be used for the statistics which are going to be compiled on institutions of higher education. As was mentioned above, this depends on:

a) Content and volume of the inquiry programme,
b) Readiness of the respondents to comply with rather rigorous standards.

23. The first aspect will have to be dealt with when the range of topics to be included is discussed. As to the second aspect, it must be assumed that students will not be very eager to fill in a questionnaire at the beginning of each new semester. This will to some extent determine the accuracy with which forms are completed. In the follow-up survey within the scope of the Microcensus, which was mentioned above, the data were entered by interviewers. It will hardly be possible to achieve the same quality with the replies of students. The chances seem to be somewhat better for the answers supplied by students at first registration. The best solution would presumably be for the questionnaires to be filled out in the final grade of secondary school with help from teachers. These questions cannot be answered definitively until after some pilot studies have been made, and the inquiry programme has become available. The advantages gained by using this technique both in time and staff, are however so great, that despite the difficulties mentioned, the opportunities offered should not be discarded at the outset.

2. *Maintenance of files, and processing and tabulation of data*

24. A total of approximately 800,000 punch cards (2 per questionnaire) will have to be produced each semester. Given the volume of work, it is obvious that the file can be updated and evaluated only by machine. The updating of large-scale files is always problematic, even with the use of modern data processing equipment, but particularly so if this is done manually.

25. The master file as such will be kept on magnetic tape. The reason is not so much the fact that the Federal Statistical Office has a large fast computer equipped with tape units, but rather because of the nature of the changes to be made in the file. Normally, one might think of storage media with random access to handle this kind of task, but random access storage units are efficient only under specific conditions. Their use presupposes that only a small percentage of the master records in the master file is changed, but that the updating run is made rather frequently. Moreover, the number of records to be changed must not be too large, because if the capacity of one random access unit is exceeded, the file, as well as the records which contain information about changes, have to be resorted. However, the particular advantage of random access media is the *unsorted* handling of such material.

26. Our particular case does not comply with any of these conditions. The up-dating is done rather seldom, i.e., only twice a year, but the number of master records to be changed is large: nearly the entire file must be changed or supplied with additional information. Moreover, the file is very voluminous, and will definitely require several of the customary random access units, so that sorting problems are unavoidable. It is therefore thought that the use of magnetic tape technique will be adequate.

27. Once the information on punch cards has been transferred to magnetic tape, checked and sorted, the further processing by machine consists of two major stages:

a) *Updating* i.e. adding newly enrolled students, supplementing data on students who continued their studies or passed an examination, tracing those students who did not continue their studies during one or several semesters.

b) *Preparation of tables.* As we cover only the students *enrolled* for each semester, it is obvious that we cannot tell for sure how many have given up their studies altogether. What we do find out is how many students did not continue with their studies for a certain number of semesters.

28. Incidentally, cases of students who have been found to have interrupted their studies, and not resumed them after a certain number of semesters, would have to be eliminated from the main file, in order to avoid it becoming unduly inflated. It would perhaps be advisable to transfer these cases to a separate file for special investigation.

29. The evaluation of the file *b*), i.e., the preparation of statistical tables does not present any specific technical problems. This is the responsibility of the specialized departments, who will have to request reasonable tables in a form which can be met by technical programming factors.

30. There are, however, major technical and organizational problems involved in updating the files. This is particularly true if an effort is made to reduce the proportion of manual work to a minimum, and to mechanize the updating of the file. In the case of an automatically processed master file, a problem of particular importance is how to cope with cases which should figure in the file, but cannot be located due to errors in punching, or in the completion of questionnaires. There is some unavoidable manual work left, but it remains to be seen how large this « rest » will be. The amount of manual work may be considerable if lists are checked manually to find any data incorporated into the file corresponding to newly punched reports. We intend to solve this problem in such a way that it requires a minimum of labour.

The Identification Number

31. The system suggested for covering the progress of students through university can only function if there is some method by which each student can be traced and followed throughout his university career. To bring together the data relating to different semesters of a student's career, it is necessary that he or she be given a clear identification characteristic on first registration, or in the final year of high school. This identification characteristic must stay with the student throughout his university life.

32. There are several ways in which identification characteristics can be formed :

a) the current enumeration of all students (1, 2, 3...);
b) the issue of a specific amount of numbers to universities for distribution to students;
c) the composition of a code based on specific characteristics (e.g. coding of the initial letters or sections of the name, date of birth, sex, university of first registration);
d) use of a means of national identification to be applied throughout the entire Federal Republic, if such a system is introduced.

Item (a)

33. If there is to be continuous enumeration, numbers can be issued by one agency only. With a present total of some 350,000 students (incl. students at teacher training colleges and other institutions), and an annual rate of some 70,000 newly enrolled students, the 6 digits needed (up to 999,999) would suffice for more than ten years. After this period, enumeration would have to be restarted. This would be possible, as after 10 years (= 20 semesters) the initial 300,000 numbers would probably become available again. In this case, it would be advisable to employ a separate enumeration system for foreign students (about 27,000 foreigners, some 6,000 newly enrolled students a year), since there is presumably greater fluctuation, and numbers might be blocked for exceptionally long periods of time.

34. For political and constitutional reasons, it is open to some doubt whether such a system could be introduced.

Item (b)

35. The same applies here as under a), the only difference being that numbers would be issued by the university of first registration. In the case of a change of university, it would not be warranted that the student would maintain the same characteristic, or that he would actually use it when filling out the questionnaire.

Item (c)

36. The characteristics would have to be decided upon, and care would have to be taken that the probability of arriving at the same code with the chosen combination of characteristics would be very low. Under these conditions an « identification number » could be dispensed with. This would have the added advantage that the six digits of the punch card needed under a) and b) could be used for codes of characteristics. Errors due to the wrong recording of a number would be excluded under this system. There are no particular methodological problems involved in this procedure, and a considerable amount of methodological work has already been done in this field[1]. This method will be further discussed below.

Item (d)

37. There have been discussions at the Federal Ministry of the Interior with representatives of the Laender concerning the introduction of a « uniform means of identification of persons » for all persons in the Federal Republic having completed the 16th year of age. This « means of identification of persons » would be the safest « identification number » possible and perhaps even provide the possibility of observing — e.g. by means of the Microcensus — the further occupational development of specific groups of persons. However, at the present stage of these negotiations it is not yet possible to say whether and when such a means of identification would actually be introduced.

38. It was decided that identification characteristics would be issued, so that the following conditions could be met :

a) They should be *issued centrally by machine*. If they were to be issued by universities, this would constitute a substantial burden for university administrations, and therefore presumably meet with some resistance. It is, moreover, open to doubt whether decentralized and manual issuance could work both punctually and properly.

b) The identification characteristic should be composed in such a way that it can *as far as possible* be constructed from reported individual data. If it were not possible to construct it by machine, the characteristic would have to be communicated to the individual student, requesting him to put it on the questionnaire. This can not be relied on, as the result would be either an extensive correspondence involving queries addressed to individual students

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[1] See « Stichproben in der Amtlichen Statistik, » issued by the Federal Statistical Office, Wiesbaden, 1960. Concerning selection according to the initial letter of the name, see *ibid.*, pp. 34, 171, 405, 406, etc.

(who in the meantime have moved, etc.) or else entail voluminous search work in long lists of the file. A serial number (described under c and d of previous section) or any discretionary combination of letters could not be constructed from reported data. On the other hand, an identification characteristic constructed from reported data and issued centrally by a computer does not in all (though in a great many) cases identify one person only. The decisive factor is that the constructed identification number should lead to few persons only, and then the person to be traced can be identified further by additional characteristics which have been punched into the machine.

First Method of »Constructing« the Identification Characteristic

59. For the »construction« of the identification characteristic, the following proposals have been made:

Date of birth (6 digits)
Initial letter of name (1 digit)
Land (State) of birth (2 digits)
Serial number (max. 2 digits)

60. The serial number could be arranged in such a way that it is an indication of sex (e.g. 00 to 49 male, 50 to 99 female).

61. An identification characteristic formed this way could be issued by machine and could, except for the serial number, be fully reconstructed. In general, only few serial numbers would be issued. Only the letter S would probably cause some difficulties as approximately 12 % of all German names start with the letter S.

Second Method of »Constructing« the Identification Characteristic

62. Another way of »constructing« an identification number would be:

Date of birth (6 digits)
»Nucleus of name« (max. of about 10 digits, see definition below)
Initial letter of Christian name (1 digit)
Land (State) of birth (2 digits)
Serial number/sex (1 digit)

63. This identification characteristic, too, can be formed and issued by machine and with the exception of the serial number, can also be reconstructed by machine. But here it is much more probable that in the great majority of cases only the serial numbers »1« or »2« (male or female) will be required since more elements of identification are made use of.

64. It is not important that this identification characteristic is of greater length than the one mentioned before, because these characteristics are used internally by the machine only and are entirely composed by it. It is not necessary to punch the identification number separately either as it is formed inside the machine from the data punched into it.

65. On the other hand — except for newly enrolled students for whom the full name has to be punched in any case — the amount of alpha punch

work involved is greater for identification method 2 than it is for 1, because in the case of 2 the full name must always be punched, whereas for 1 this need be done only for the initial letter of the family name. Though there is additional manual work involved, this is compensated by certain organisational advantages: the « nucleus of the name » can have an important function in search operations performed by the machine for « cases not located. » If the name had not been punched, as is the case with the identification characteristic under 1, it would be necessary to have a print out of all unlocated cases, and then to find all the corresponding questionnaires (which may require the sorting, or at least the pagination of the questionnaires). Afterwards, punch cards *with* full names would have to be prepared, transferred to tape and sorted. All of these operations could be avoided if the characteristics of 2 were used.

46. So far the « nucleus of the name » has not yet been defined. Forming this nucleus involves the following rules:

- *a)* Elimination of all vowels from the name (exception of vowels or umlauts, i.e. diaeresis, at the beginning of the name).
- *b)* Elimination of double consonants.
- *c)* Using particular consonants to designate groups of consonants pronounced similarly.
- *d)* Using a particular consonant to designate another pronounced similarly.
- *e)* Double consonants are used only once.
- *f)* Hyphens are left out of names.

47. The detailed programmes and applications have been worked out for the German language, and here are a few examples of how this system works.

Full name	*Nucleus of name*
Abatz	APZ
Calerko	KRK
Calercko	KRK
Cirocko	KRK
Maier	MR
Meyer	MR
Mayer	MR
Meir	MR
Mayr	MR
Kullmer	KLMR
Grohmann	KRMN
Schmitt, Schmit	SHMT
Schmidt, Schmid, Schmied	SHMT

48. The purpose of this elimination of letters is to give the same abbreviation to names which may easily be mistaken for each other when written or read. As the rules apply only to the German language, it is not thought that their detailed workings should be outlined here. Rules as complicated as the ones used for this conversion can only be observed satisfactorily by computer. The relevant programme has been tested, and proved very workable indeed. There is no reason why similar codes cannot be devised for the names common to other languages as well.

49. The problem of choosing an identification characteristic has been mentioned in such detail, because it is a problem that has to be faced sooner or later by statisticians who intend to use an individualised data system for the collection of statistics.

50. As has been mentioned, the preparation of tables does not present any very difficult problems, but there are major technical and organizational problems involved in updating, if an effort is made to reduce the amount of manual work to a minimum.

UPDATING

51. Because of its intricate nature, the entire process of updating is not very suitable for discussion in an annex such as this. Therefore, the problem of machine searching for cases which should, but cannot be located in the file will be concentrated on.

52. For updating, the reports to be handled — i.e. punch cards for newly enrolled students, students in general and examinees — are sorted by machine according to the identification characteristic. With magnetic tape sorting, it does not matter that the identification characteristic is rather long. The reports to be processed are then compared with the master file. This operation yields a new and corrected file. The data for newly enrolled students are included in the proper place ; if relevant data are located in the master file, additional information for the current semester may also be included in the records of other students and examinees. It would be possible to check whether amongst the older newly enrolled students there are cases which should not be considered genuine new cases, but rather cases of studies being started anew after a number of years, or where the student, after such an interruption, had embarked upon another branch of study. There is no need for such checks in the case of newly enrolled students who have just reached the minimum age for university attendance.

ERRORS, AND THEIR LOCATION

53. The updating run described above is a common feature of the maintenance of large files so that it is not necessary to go into further details. What is important here is the fact that during this run, cases will always be found in which an existing report for a student or examinee does not match any master record. This may be due to a number of causes :

a) *Errors of coverage* : The student in question was not recorded in the file although he had already been studying for some semesters. This kind of error will have to be expected, particularly in the early stages of data collection, when files have just been established.

b) *Writing or punching errors* : In the case of name and birthday, these errors arise primarily out of illegible handwriting. These errors will always occur. Moreover, it is to be expected that students, being indifferent to statistics and questionnaires, will not always fill them out with sufficient care.

c) *Incomplete or erroneous data, or incorrect coding* : These errors can arise in the description of the university at which the student registered for the first time ; for female students who are married, indication of the married name instead of the maiden name, etc.

54. Errors of types *b*) or *c*) affect the identification characteristic, so that the relevant master record cannot be located if checks of type « equal » or « unequal » only are made, as would be the case in the updating run described above.

55. It is not possible to show such cases in the file as newly enrolled students. This would be possible only in case *a*). In all other cases there would be a twofold error : On the one hand, cases which were not new would be recorded as such (in any case the student would not be in his first semester) : on the other hand, the entry for the current semester which cannot be located (and possibly also for other semesters) would be missing in the corresponding master record. So that an interruption or cessation of study would be recorded, when this had not really taken place. Accordingly, a search must be made to find a corresponding case in the master file. So far, this problem has been solved largely by printing the data for the cases not located and by having them handled manually. A large number of staff has to check the complete lists of the file containing all data to search for *similar* names, or data which matched — except for minor discrepancies (writing or punching errors, etc.) — those looked for If this did not prove of any help, voluminous correspondence had to be carried on in order to clear things up by relevant queries. This part of file work especially, requires a vast amount of time and effort, and it is one of the reasons why with tasks of this kind, modern computers do not always provide the degree of rationalization sought. The use of electronic computers is envisaged and this will reduce manual work substantially, however it cannot be eliminated altogether.

56. The procedure followed is analogous to that used in manual search work : « similar » names or data must be found. For the machine, a definition must be given of what is to be considered « similar. » If we assume that most discrepancies arise out of errors in writing or punching, it may be considered that two names are similar if they differ by no more than a certain number of letters (a corresponding definition could be given for the date of birth etc.). How large the admissible number of differing letters or digits will be, will have to be determined by practical tests. For present purposes, it will be assumed that a maximum of one or two errors is admissible.

57. The search operation proper to establish whether unlocated cases are included in the master file is then made in two « search runs. »

1st search run

58. Here it is assumed that date of birth and first letter of the name are correct, but that there may exist errors in the other characteristics which determine the order of sorting. Search reports and the master file must therefore be sorted according to date of birth and first letter of name. All cases in which date of birth and first letter of name match exactly, and where other data (name and Christian name) are similar, i.e. match exactly, except for 1 or 2 differences, are separated. If other comparable data, e.g. university of first registration, marital status, branch of study, number of semesters, etc. are in agreement, the search report is allocated by machine to the master record thus traced, so that the necessary entries can be made. If, among the « similar » cases, there are none which satisfy these conditions,

the similar cases are duplicated and recorded on a separate tape. After the first search run there will still be a number of cases to settle. The corresponding tape is sorted again for the second search run.

2nd search run

59. For this run a second file is needed, the content of which fully conforms with that of the master file used so far. However, the records are sorted in a different way, according to nucleus of name. The two files must always remain consistent with each other. This applies to the updating runs and must also be considered in the search runs. This will not be dealt with here in detail.

60. In the second search run it is assumed that at least the nucleus of the name has been stated correctly. The search reports are therefore, sorted according to nuclei of names. The second file is already in this order. The search operation now proceeds as in search run No. 1 : From the records of the second master file which have the same sorting characteristic (nucleus of name) as the search report, we separate out those records which contain data similar to those in the search report, i.e., those records that do not differ by more than two characters in the name and date of birth. If we locate amongst these separated records another in which all the other data, also existing in the two documents, conform exactly, it may be safely assumed that the right master record has been traced, and the material may be processed accordingly. If no such record can be located, all « similar » records are stored on tape along with the search report.

61. After both these search runs the two files have to be reconciled with each other. Also, the two tapes containing « cases not located » from the search runs are checked against each other. It is then possible to make a print out showing the « cases not located » and to treat them manually. It must then be decided whether one of the master records found to be « similar » is in fact the sought record ; when this is not the case a query cannot be avoided.

62. Though there is still a phase of manual work in this procedure, its volume is greatly reduced when compared with the practices followed thus far. The team performing the manual work no longer need handle the enormous lists of the entire master file, it needs merely to check a small part of it, that part which is likely to contain the required information.

63. When evaluating the performance of such search systems, it must be remembered that no method is perfect. If a student registers as Herbert Schulz, born 11th May 1936, and then the following semester reregisters as Ali ben Jussuf born 25th December 1937, it is not possible to trace his identity either manually or by machine. However, compared with manual searching, if a machine search system can operate on the basis described above, it should prove to be better suited to performing the required search tasks.

64. All acceptable search systems must meet certain standards :

1. Provided that the search report has been correctly punched, the record sought must always be traceable in the master file. This is a fundamental requirement for the system to be of any use. In

the case of a machine operated file this condition is met, but this need not always be so with manual maintenance of files.

2. When a record has not been located in the master file, the search report cannot ensure that it will later be traced. At best, « similar » master records will be found.
3. With the search procedure used, there should be a high degree of probability that search reports which differ only slightly from the sought master record will enable the master record to be traced (and perhaps other « similar » records).

65. This latter point presents a problem of definition : the wider the interpretation of « similar, » the greater is the likelihood of tracing « similar cases » which include the right record. However, the wider the interpretation of similar, the more manual checking of lists that must be done. Modern electronic installations offer the possibiltiy of checking the proper functioning of such a search system, so that it can be improved to such an extent that the results achieved compare favourably with the expenditure of time and effort.

66. It is hoped that this outlining of the technical problems involved in setting up an individualised data system by the Statistical Authorities in Germany, will be of interest and help other statistical bodies contemplating the same move.

Annex IV

THE STUDENT REGISTER OF THE UNIVERSITY OF COPENHAGEN

1. The register was started in 1964. So far not all the intended information has been registered but a gradual development is taking place.

2. The register last year produced traditional stock statistics, that is the number of students distributed accordingly to a rather large number of criteria such as year or registration, faculty, branch of study and main subject (32 categories), type of high school leaving examination, marks obtained in high school leaving examination, geographic location of the high school from which the students came, etc.

3. This year the register will be used to produce a survey of « movements of students. »

4. The students indicate their status during the current and past years. Thus movement from one field of study to another, drop-out, examinations and activity of students who were inactive last year can be given.

5. Aarhus University runs a more modest student register which can nevertheless feed the Copenhagen system with relevant information for statistical purposes.

6. For other institutions of higher education another system is applied, this system being in principle very similar to the system of I.D.-statistics for pupils in the non-compulsory part of the primary and secondary school system.

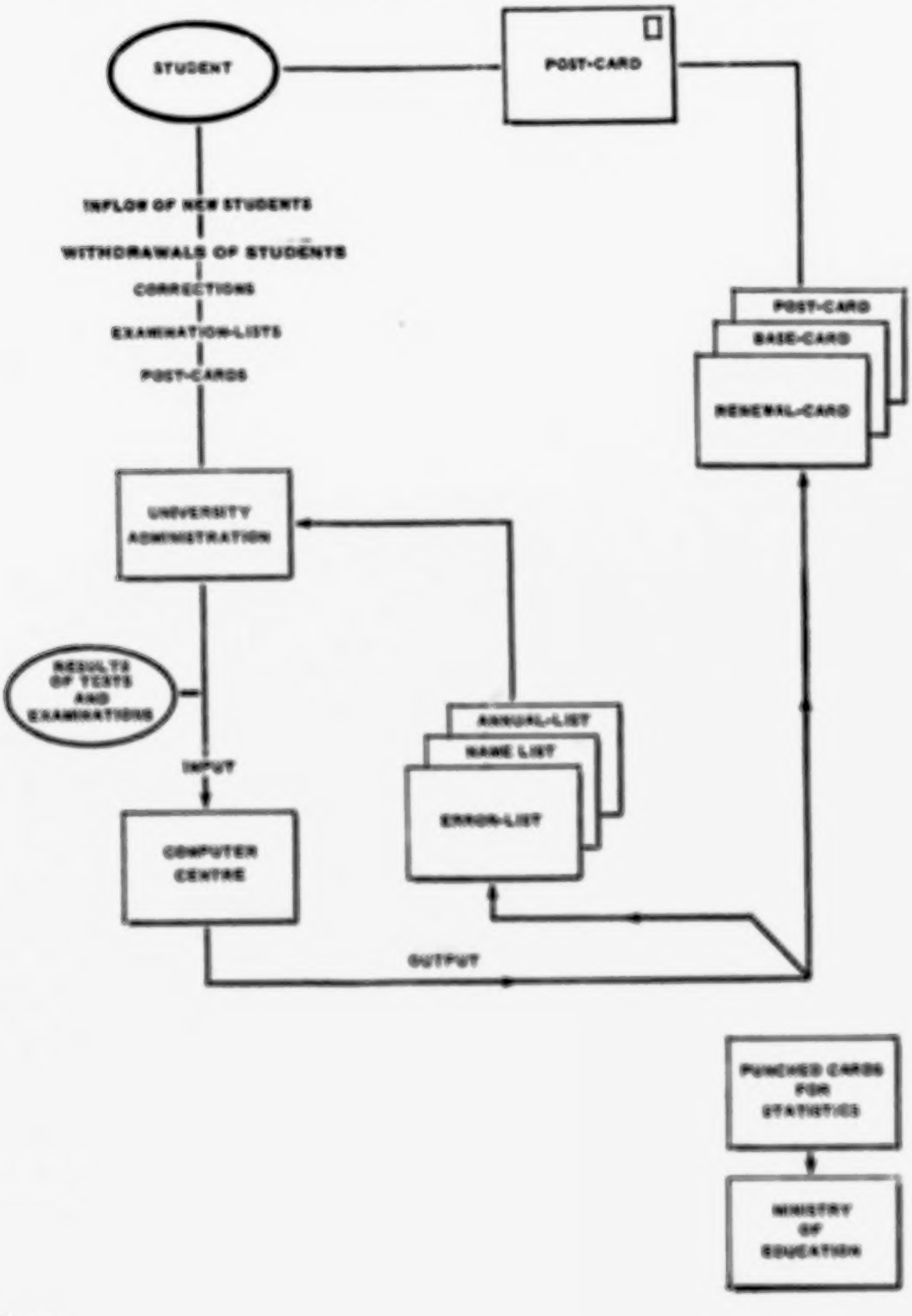
7. The present system does not allow the registration of movements of students from one institution to another. However, a national identification number is going to be introduced shortly. Consequently movements between different institutions will be registered in the future.

A Brief Survey of the Copenhagen University Register

8. On the basis of an up-dated register of all students at the University of Copenhagen, it is intended that the I.D. system serve the following purposes.

   1. Supply information for the University Administration obtained through periodic transcriptions from the register (base-card, renewal-card, annual list, etc.).
   2. Supply statistics according to specifications from the University and the Ministry of Education.

UNIVERSITY OF COPENHAGEN STUDENT REGISTER


STUDENT
POST-CARD
INFLOW OF NEW STUDENTS
WITHDRAWALS OF STUDENTS
CORRECTIONS
EXAMINATION-LISTS
POST-CARDS
UNIVERSITY ADMINISTRATION
RESULTS OF TESTS AND EXAMINATIONS
INPUT
COMPUTER CENTRE
ANNUAL-LIST
NAME LIST
ERROR-LIST
OUTPUT
POST-CARD
BASE-CARD
RENEWAL-CARD
PUNCHED CARDS FOR STATISTICS
MINISTRY OF EDUCATION

Basis

9. The student register is based on the « viscard-index » of the University Administration Office, information from this index having been transferred on to magnetic tape for all students who were active in 1958/59 or later.

Structure of Register

10. The student register is divided into 2 sections:
    1. *The current register* listing all active students of the University, as well as those who have notified a temporary cessation only, of their studies. This register contains completely up-to-date information on the students.
    2. *The archive register* containing information on High School Certificate « Studentereksamen, » change of field of study, if any, and past examinations and tests and their results. Moreover, the archive register contains information on students who have terminated their studies since the magnetic tape register was introduced. No time limitations have been stipulated for the keeping of the archive register.

Contents of the Student Register

11. The student register records:
    1. Students number, consisting of year of registration and a 4-digit continuous number for each year of registration, in all 6 digits. The year of registration is the period 1/6-31/5 and only the first year digits are included (e.g. the year 1963/64 is stated as 63).
    2. Matrimonial status, 1-digit code,
       0 : not stated, 1 : single, 2 : married, 3 : formerly married.
    3. Sex, 1-digit code. 0 : not stated, 1 : male, 2 : female.
    4. Status codes, 2 digits. These codes state whether the student is currently enrolled (codes 11 and 21-39) or not (codes 12, 13 and 41-49) where the second digit reveals the cause.
    5. Bith date, consisting of year, month and date, in all 6 digits.
    6. Initials consisting of the first two letters of the first name and the first two letters of surname in numerical form, in all 8 digits. For married women the first two letters of maiden name are applied.
    7. Faculty, 1 digit.
    8. Branch of study, 2 digits.
    9. Examinations passed, 1 digit, states which part-examination is passed, 0 : No part-examination passed (or only examination of subsidiary subject passed — philosophy faculty).
       1 = first part — or teacher's examination passed.
       2 = second part — examination or special test passed.
       3 = initial examination passed.
       5 = final degree taken.
    10. Main subject, 2 digits.
    11. Subsidiary subject, 2 digits, identical with the main subject code.
    12. Commencement of study, date, month, and year, in all 4 digits.
    13. Status (currently enrolled or not) date, month and year of the latest alteration of the status code, in all 4 digits.
    14. Termination date, month and year, when the student will terminate current studies, in all 4 digits.
    15. Latest annual card, 2 digits, contains the latest academic year for which an annual card has been issued.
    16. Year of leaving, secondary school 2 digits.

17. Type of High School Examination (« Studentereksamen ») 2 digits.
18. Marks obtained in High School Leaving Examination, 4 digits.
19. School code, 3 digits.
20. Address unknown, 1 digit. A one is inserted here, if the new address is unknown. The old address is kept in the register, but in case of transcriptions for the student, the address remains blank.
21. Name and occupation.
    Occupation is only stated if it requires an academic degree. The order is as follows: Surname, first names in correct order and occupation, if any.
    Abbreviations are used, where name, occupation, comma, and space together exceed 35 positions.
22. Address, consisting of street, No., floor, side, and postal district.
23. Married women's maiden name (surname) 20 positions.

UP-DATING

12. The student register is up-dated partly by notification of new entries or withdrawals and partly by notification of changes prepared by the Administration on the basis of students' own information. Moreover, once every year a reply-card is sent to students which they have to return duly filled in.

13. Up-dating runs are divided into 3 types.

A. *Renewal-run* where information from the reply-card is entered beside other previously recorded information. The main purpose of this run is to write out renewal cards for all students having filled in the reply-card. This also serves the same purpose as an ordinary up-dating run.

B. *Run of annual list.* The main purpose of this run is to write out the annual list which must include all current students at the University, and in addition to produce statistics for the Ministry of Education. It also fulfills ordinary up-dating requirements.

C. *Ordinary up-dating.* The purpose of this run is to write out alterations for identification cards and renewal cards to produce a list of errors, a list of withdrawals, and a list containing complete up-to-date information on all students on the register tape.

DATES OF RUNS

14. Approximately 6 yearly runs are expected, consisting of a renewal run at the end of August, an annual list run early October, and possibly four ordinary up-datings over the rest of the year.

CONTENTS OF THE ARCHIVE

15. The archive is divided into 3 types of records.

A. Information on High School Certificate of all students entered in the annual list since the start of the archive.

B. Information on study for all students who have interrupted or completed their studies.

C. Examination grades of students who have sat for examinations and tests.

16. Re: A. Student number, sex, birth date, information on High School Certificate, matrimonial status and initials, see contents of the student register.

1. Record number, 2 digits, the first record is 01, the second record 02 and so forth.
2. Type, 1 digit indicates a High School Certificate record.
3. Married - year, 2 digits, year of matrimony or annulment.

17. Re: B. All details are described under the contents of the student register, except record number (see A.1) and type, 1 digit indicating a study record.

18. Re: C. Student No., birth date, faculty, study, main subject, subsidiary subject, examinations passed — see contents of student register.

1. Record No., see A. 1.
2. Type, 1 digit indicating an examination record.
3. Examination date, 4-digits, year, month, is the date of the test or part-examination in question.
4. Test passed, 2 digits, is a code for the tests for which the student has entered. This code list will be worked out by the individual faculties.
5. Examination grades, 5 digits, indicates the number of marks the student has scored, even if the result is too low for the student to pass the examination.

PROCEDURE OF UP-DATING

19. Before the day of up-dating, the University Administration Office delivers information on changes as well as details on new entries and withdrawals to Datacentralen who will punch cards from this information.

20. The renewal-run-punched-cards run through a checking procedure on an IBM 108, where the punched cards are examined for elementary errors. Cards containing errors are selected, and the cards are repunched inclusive of alterations, and go through another 108 testing procedure.

21. After this, the accepted punched cards run through a conversion procedure on an IBM 1401, during which the information on the punched cards is transferred to magnetic tape. This magnetic tape is sorted according to

1. Student No.
2. Date.
3. Type of card.
4. Code of alteration.

22. This sorted magnetic-tape recording the new information is entered on a tape together with information contained in previous tapes making up the student register and the archive respectively, for the final up-dating on an IBM 7074. By this procedure an up-to-date archive magnetic tape, and up-to-date student register tape and several transcription tapes are obtained.

23. These transcription tapes are sorted in an order required for administrative purposes.

Base card	Nationality and name.
Renewal card	Nationality and name.
Annual list	Faculty, field of study, main subject, and name.
Withdrawal list	Name.
Name list	Name.
Error and dump list	Student number.

24. These sorted magnetic tapes are edited for transcription via the 1401. Once every year (annual list run) a statistics tape is produced which is ready for direct punching.

Annex V

A CONCEPTUAL SCHEME FOR THE ANALYSIS OF DATA ON EDUCATIONAL FINANCE[1]

I. INTRODUCTION

1. In this handbook consideration has been given to methods or estimating pupil numbers, teacher requirements, general manpower requirements and how the real resources used in education can be converted into monetary terms by means of various cost indicators. It is, however, one of the elementary axioms of economics that if real resources are allocated to one economic activity, in this case education, they cannot, at the same time, be available for other economic activities. This means that any planner who is concerned with the use of resources in one particular branch should be aware of the mechanisms by which resources are earmarked for this activity. In most economics it is by controlling or influencing financial flows that policy makers and administrators can direct the allocation of real resources to any particular branch of activity. In order that these financial flows can be oriented in a rational way consistent with general policy objectives it is necessary to understand the mechanism by which these financial flows are translated into real resources for specific economic activities. The present paper outlines a schematic framework within which these financial flows can be analysed. A subsidiary aim of the paper, closely linked with the first, is to provide a conceptual scheme within which financial flows that represent merely transfer of funds (e.g. transfers from central government to local government, or payments of grants to students) can be separated from monetary flows which represent utilization of real resources (payment of teachers' salaries, etc.). This can avoid many of the problems which occur at present when educational expenditures are compared with other national income aggregates.

2. The implementation of educational policy can be viewed as a three-stage operation so far as the allocation of national resources is concerned. The first stage is the determination of the amount of the public budget to be devoted to educational expenditure and, where relevant, the determination of the amount of revenue raised specifically for the finance of education. The second stage is the division of the educational budget itself between different levels of education and forms of expenditure. The third stage is the designing of budgetary measures, such as taxes and subsidies, which influence other decision-makers such as state and local governments, private

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[1] This annex is contributed largely by Alan Peacock who advised the Secretariat on the Public Finance aspects of educational statistics.

educational institutions and households, to spend on educational purposes according to policy criteria. It is clearly necessary, therefore, to devise some set of model accounts which show clearly the various methods by which can also be fitted or adapted to the framework of accounts used for economic projections and/or forecasts commonly carried out by national governments.

3. Sections II and III discuss the general conceptual and statistical problems which beset any attempt to produce model accounts in accordance with the requirements laid down in the preceding paragraphs. In Section IV the principles underlying the construction of the model accounts are explained and in Section V, the policy uses of the accounts are briefly explored. Finally Section VI deals with some of the conceptual issues involved in considering educational expenditures as a component of national income aggregates. The Appendix gives a brief account of experience in assembling existing data from one OECD country in order to implement the proposed accounting system.

II. General Problems

4. In devising a useful set of accounts for education, it seems sensible at first sight to extract the « education sector, » as it were, out of social accounts for the relevant economies following, for example, the conventions adopted in the Standardised OECD (OEEC) system[1]. This is because social accounts, including both income and expenditure accounts and flow-of-founds (financing) accounts, form the statistical framework for national budgets, which are now extensively used in economic and social planning. In principle, therefore, the social accounts would highlight the position of education in the economic system and its relationship with other activities in that system which affect the use of resources. It is not necessary to go very far with such an attempt to follow social accounting conventions before it is discovered that important conceptual and practical difficulties arise in delineating the position of education.

5. If education were an economic activity comparable with others, it would be a relatively easy matter to devise a conceptual framework indicating how it is «produced» and financed, whether or not «production» were carried out by private or public bodies. One could then construct a production account with the values of sales on one side and value of purchases on the other. Following social accounting convention, one could then divide sales up into sales to « final » buyers depending on whether the product was regarded as a consumption or a capital good and intermediate sales, i.e. sales to other production sectors. On the other side of the account, the value of purchases would be divided between « final » inputs, i.e. factor payments (rent, interest, profits, payments of wages and salaries and depreciation) and imports, and intermediate inputs, i.e. purchases from other production sectors. The difference between the total value of sales and the purchase of intermediate inputs would yield the « net product » of « education. » Finally, one could draw up a capital account recording

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[1] See a Standardised System of National Accounts, 1958 Edition, OEEC, January 1959, which makes brief reference (e.g. pp. 36-37, p. 63) to the place of educational institutions in the social accounts.

how investment in plant and equipment and in stocks is being financed. In short, education could be fitted neatly into a national accounting system and flow-of-funds system so that its place in the economy would be made clear.

6. In practice, the attempt to follow fully the dictates of social accounting is beset with difficulties, of which the main ones are discussed in the following section.

THE DEFINITION OF EDUCATION

7. In the first place defining education raises more difficulties than many other forms of production. It is common practice in national and international official documents to adopt a fairly narrow definition which covers only public and private institutions providing « formal » instruction. For example, in the *UNESCO Manual of Educational Statistics* (1961) an organisation providing education is one in which « a group of pupils (students) of one or more grades (is) organised to receive instruction of a given type and level under one teacher, or under more than one teacher and with an immediate head » (p. 79). The problem of definition is of course, one which is important in all aspects of educational statistics, but it is particularly difficult in the case of finance, as is shown in the following paragraphs.

8. Two major difficulties are encountered in attempting to apply a purely pragmatic definition such as that suggested by UNESCO. The first is that if we define an educational institution in terms of what it does rather than by its organisational characteristics, we would find that other methods of instruction may be competing substitutes for formal ones. For example, mother's care, on-the-job training, and home study may be substitutes for kingergarten, or elementary school, vocational training and higher education respectively. Machlup[1] for example considers it essential in measuring the cost of education to include an imputed value for mothers' teaching which is a substitute for kindergarten and elementary school training or for the services of a governess. The method of calculation is not important here, but the total value of these services in the Machlup calculations represents 7 per cent of the cost of education in the United States of America in 1958. The important point which emerges from this problem of definition is that if we accept the economist's argument, not only would the value of a significant part of education production have to be imputed, but in doing so the definition of national product itself would be widened in the same way as it would be if housewives' services were included.

9. The second difficulty is that if education is defined as the activities of establishments offering formal instruction, then these usually perform a whole variety of services other than teaching and research, such as school health services, conveyance of pupils from home to school, catering, residential facilities, recreational services, and civic services such as provision of rooms for meetings and even, in many countries, voting booths for national and local elections. Apart from « production » activities they may

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[1] Fritz Machlup, *the Production and Distribution of Knowledge in the United States*, Princeton 1962, pp. 54-56.

act as financial intermediaries concerned with the allocation of funds to support pupils and students, as in the case of a private school which received donations which are to be devoted, for example, to the provision of scholarships and bursaries for school-children from poor families. Certainly, the phenomenon of the multi-product firm is frequently encountered in industry, so that education only provides an example of a commonly found difficulty, but the point still remains that it is not always clear what is an educational « product » and what is not. For example, some educators place great emphasis on the educative function of colleges and residences as social units, quite apart from their function as purveyors of food and lodging.

10. In the case of statistics of pupils, teachers, etc., it is possible to avoid the necessity for defining education by adopting the pragmatic solution of defining the separate components, pupils, teachers, etc. This fact that « education » is often produced jointly with other products makes this a difficult solution in the case of finance.

11. All that we can hope to arrive at present is a « workable definition. » The test of a « workable » definition is its use for policy-making. Generally speaking, and recognising that there may be many exceptions to the rule, educational policy is implemented through formal institutions administered or controlled by some branch of the public sector or through private formal institutions with similar and comparable functions which may receive public support. This rough-and-ready rule produces a bias in this chapter towards the « conventional wisdom » which emphasises the characteristic of formal instruction. At the same time, the rule would allow for the fact that some services other than instruction, e.g. research carried out in educational establishments, which are closely connected with education, must be included.

The « Producers » of Education

12. There are always problems encountered in delineating the production sector for any particular commodity. The usual method is to classify sectors according to output rather than occupation, but even this rule does not offer unequivocal guidance within the production sector, and does not place all production tidily in firms. The production of educational services may take place within firms whose primary purpose is to produce other things, as in the case of on-the-job training. Households, as we have seen, may provide educational services. However, the most important problem is presented by the obvious fact that a large part of educational services are provided by the central or local governments. Statistically, this may help a great deal because this concentration of production facilitates collection of data. Conceptually, however, we are now faced with a whole range of complications.

13. The introduction of the government as a producer of educational services would offer no difficulty in presentation if these services were simply sold to buyers. The government would then be operating a nationalised service which could be incorporated in the production sector. However, this is not the case. Many industries, it is true, rely upon subsidies of one sort or another from the state and even firms within an industry may subsidise each other, e.g. through price agreements which protect small

producers. Education is an extreme case of « cross-subsidisation. » To begin with government educational services may be financed largely from taxes and from loans. The government itself may finance private educational facilities by transfers of money to individuals undergoing training, by subsidies to the educational producers themselves in the form of current and capital grants, not to speak of loans. This prevalence of « cross-subsidisation » itself suggests the means by which policy decisions in education may be implemented so that clearly financial flows must be clearly shown in any set of simple accounts. This simplification is a major influence on the suggested framework for the social accounts of education presented below.

14. The provision of educational services by the government on a non-commercial basis brings out another complication. The educational establishment may be the control unit for the conduct of instruction but not for purposes of accounting. A firm pays its employees, but teachers may be paid not by the school but by some organ of government. In France, for instance, all salaries of teachers in State schools are paid directly to them by the Ministry of Education. It could also be the case that a private foundation governing several schools would be operated along the same accounting lines as is the case, for example, with the Scottish Merchant Company Schools. This makes the drawing up of an income and expenditure account for educational establishments operating according to different accounting principles something of a headache unless some national *transfer of funds* takes place to cover such items of expenditure as mentioned above from the accounting to the teaching authority.

EDUCATIONAL « INPUT » AND « OUTPUT »

15. The implication of the preceding paragraph is that a large part of educational services is not priced. We have no record, therefore, of the value of total output of government-produced education, and no division of that output into final sales and intermediate sales. It is therefore impossible to apply the usual type of measures of productivity to educational services, the case being exactly parallel with that of many other government services. Some obvious problems arise, therefore, in tracing the sectoral contribution of educational services to GNP and in expressing purchases of educational services on consumption and investment account as proportions of total consumption and investment expenditure and of Gross National Expenditure. No attempt has been made to resolve these problems within the framework of our statistical presentation, but they are further considered in Section V.

16. Under the same heading it is necessary to clarify the distinction between investment needed to produce educational services regarded as an input, and output of educational services regarded as « investment in human-beings. » The former form of investment raises no conceptual issues which are different from these encountered in defining investment goods in other forms of activities. The latter form, however, is not one which is recognised in any social accounting scheme. There is at least one good reason for this. As Machlup stresses[1], the decision whether to treat educational

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[1] F. Machlup, *op. cit.*, pp. 108-110.

effort as consumption or investment or a cost of producing current output is largely a matter of one's point of view. It may be agreed that present inputs of resources into educational facilities have a profound effect on the future performance of the economy, but another matter to agree on what proportion of educational output is of an investment character. Apart from this obvious difficulty, the term « investment in human beings » or « non-physical investment » is not found in social accounting parlance and there are those who may object to it on the grounds that it connotes some form of slavery.

17. An additional and rather (for some) uncomfortable consequence of treating the educational process as one of investment in human beings is the emphasis that it places on the position of the individual who is subject (or who subjects himself) to the educational process. This would suggest that the family in the case of school-children or the student is like a « firm » buying inputs of education in order to produce and to improve skills. If, therefore, there is a policy interest in collecting information on the uses to which educational « output » is put, it could not be readily presented in conventional social accounting form unless the family or student were treated as part of the production sector. It is considered undesirable, in the present context to enter this dangerous terrain in the presentation of statistics and we have neither labelled any part of educational output consumption, intermediate output or investment, nor delineated the sectors *using* educational services.

18. A final conceptual point may be made related to the presentation of tables indicating how education is financed. Clearly, these tables will have to show the actual payments received and, where appropriate, made by educational institutions in the form of grants and loans from public or private bodies. However, the pattern of educational provision, particularly in the private sector, may be markedly affected by « indirect » subsidisation through special tax treatment e.g. in the form of tax allowances for children, tax concessions for educational trusts, etc. While recognising that these indirect methods of finance may be important and may have unintended effects (as is true also in the case of, say, tax concessions to industrial concerns, e.g. for encouraging capital investment), it would be misleading to embody a figure for tax concessions in our accounts. There is first of all the simple objection that tax concessions involve no transfers of funds from the state to private institutions or individuals. There is, secondly, the objection that the influence of these concessions is already manifested in the loans, grants and fees paid by individuals and institutions which are contingent on these concessions.

III. STATISTICAL DIFFICULTIES

19. In this section we are less concerned with the more obvious difficulties which will inevitably arise in the collection of data to fit any classification, than with those which affect the nature of the classification itself.

20 Some of the really difficult problems of statistical implementation have been avoided, if not solved, by the decision to confine the educational sector in our tables to institutions engaged in « formal instruction ». It

may be as well, however, to explain how the statistical difficulties would have been increased by following a more strictly « economic » definition. For one thing, a definition which was extended, for example, to cover households would present the difficult task to the statistician of imputing a value to those services of parents and others labelled as educational. For another, the separation of non-educational activities from educational ones carried out by educational institutions comes up against the snag of allocating joint costs. This is clear enough in the case of capital costs, but even in the case of running costs it may be difficult, for example, to divide up the salary payments of administrators in such a way as to reflect the allocation of their time as between educational and non-educational functions. While we avoid these difficulties in concentrating our interest on the finance of education, they re-appear when we attempt to reconcile our tables with the requirement of measuring educational resource-use in Section IV.

21. The major problem of statistical implementation which is characteristic of educational provision is that of extending the collection of data to the private sector. In most of the international comparisons so far made which are in any way reliable, the private sector has been very much neglected. The input of statistical resources in order to cover the private sector may have to be large in some countries. Even the suggested definition of education may not make it easy to identify private institutions and, in the end, present size and probably rate of growth in the private sector may have to be large in some countries. Even the suggested de-there are good reasons for concentrating a fair amount of effort on the private sector if only because the effect of methods of finance not shown in our set of accounts can only be reflected in the expenditure trends in private education.

IV. Principles Underlying Financial Accounts for Education

22. The difficulties described in Section II above suggest that rather than draw up a fully articulated set of social accounts for education which extracted the « education content » from the activities of the main decision-makers (government, firms, households and « rest of the world »), which would show the relative importance of educational transactions alongside other transactions in each sector, it would be sensible to be more modest in our aim. Furthermore, the problem of statistical feasibility suggests that it may be better to sacrifice comprehensive coverage which would require a good deal of guesswork for a narrower coverage which would produce more rapid returns in the way of accurate information. This is not a recommendation which would appeal to everyone. Economists might argue that « guesstimates » in order to value a large range of parameters in an economic model embodying the education sector may be more useful than accurate calculations which leave a large part of the model unquantified. However, our emphasis on the finance of education, and particularly on the control over the size of the education sector exercised by government through financial flows may justify a bias towards working « outwards » from activities of one group of transactors, the government authorities of all levels, whose income and expenditure transactions relevant to education can be relatively easily identified, rather than working « inwards » from a comprehensive theoretical framework embodying all possible transactions

between the main decision-makers in which it is impossible to assign values to more than a few inter-sectoral flows.

23. This suggests that we begin by drawing up a consolidated revenue and expenditure account for education sector narrowly defined which is the counterpart of the combined production and capital account for an industrial sector of the economy as briefly described in paragraph 5 above. We are then able to highlight the differences between education and other forms of « production » already noted as they are reflected in the accounting system.

TABLE I. CONSOLIDATED REVENUE AND EXPENDITURE ACCOUNT OF THE EDUCATION SECTOR

REVENUE	EXPENDITURE
I. SALES OF GOODS AND SERVICES	V. PURCHASES OF GOODS AND SERVICES
a) To Central Government	a) *Current*
b) To Local Government	*i*) Wages and Salaries
c) To Private Sector	*ii*) Other
d) To Rest of the World	b) *Capital*
II. TRANSFERS	
a) From Central Government	VI. INTEREST ON DEBT
b) From Local Government	*a*) To Domestic Sectors
c) From Private Sector	*b*) To Rest of the World
d) From Rest of the World	
	VII. REPAYMENT OF LOANS
III. OTHER INCOME	*a*) To Domestic Sectors
	b) To Rest of the World
IV. LOANS	
a) From Central Government	
b) From Local Government	
c) From Private Sector	
d) From Rest of the World	
Totals	

24. The first differences from the production and capital account of commercial enterprises arises from the fact that if we simply consolidated and reclassified the accounts of educational establishments, we could find that important items of expenditure would be missing, wages and salaries paid directly by government being the example already given. We have therefore to add such items, where relevant, to the expenditure side and balance them by a transfer on the other side of the account from the relevant controlling authority. On the other hand, while our definition of education as activities of formal education establishments allows us at this stage to include « production » activities other than instruction, it is probably only confusing if the activities as financial intermediaries are explicitly shown in Table I. An alternative treatment is suggested in our model accounts below.

25. The second difference lies in the relative importance of the various receipts and expenditures. Item I corresponds to the value of sales of a commercial enterprise and would in practice be largely income from fees paid by households or on behalf of them. Another item of growing importance may be « contract research » undertaken by universities which is

« bought » by government, although the method of finance may as an alternative be more appropriately shown as a grant from government under Item II. What is important is that Item II rather than Item I is likely to be the most important general source of finance. It would include all forms of « unrequited » payments whether earmarked for special purposes or not[1].

26. While Table I may give some general indication both of the relative importance of different kinds of finance for education and of the economic resources used by education in the form of consumption and capital goods, it does very little more. In the rest of this section we shall discuss three elaborations of this account which are necessary if statistics of educational finance are to be usefully employed for policy purposes.

27. The first elaboration is a simple one. Table I could be re-classified on the income side according to type of transactor, i.e. public and private sectors, rather than by type of economic transaction as required by social accounting procedures. On the expenditure side, too, there are at least two alternative classifications which are necessary. One is the classification of expenditure by *level of education*, with perhaps a sub-classification according to *economic categories*. Another is to adopt a *functional classification* distinguishing administration, instruction, research expenditure and « non-educational expenditure » undertaken by educational establishments. Again there could be a sub-classification under each functional heading showing economic categories. These additional classifications can easily be embodied in the model set of accounts given below.

28. The second elaboration is made necessary by the complicated structure of both the organisation and the finance of education which is not brought out in Table I. An example may make this point more clear. Consider a student who attends a university entirely financed out of fee income and whose family pay all his fees. This transaction would appear in Table I on the income side as a sale of goods and services to the private *sector [Item I c)]*. There would be an exact parallel here with a sale to a household by a business enterprise selling any commodity. *Consider now* two further cases, one where the student receives a scholarship from a local government for the same purposes and one where the student receives a scholarship from a private foundation in order to study either at a state university at home or to study abroad. In both cases (ignoring the study abroad alternative for the moment) there would be no alteration in the classification of this transaction in Table I. However, behind the payment of the scholarship in each of these cases, there is a chain of transactions which affects all the main decision-making groups within the economy. The scholarship paid by the local authority may itself depend upon funds received not only from local taxation but also from central government. The central government in turn will depend on tax revenue for its funds and even foreign aid in some instances. The scholarship paid by the private foundation may be financed out of grants received from private donors or income from stocks and shares held in enterprises. We illustrate the complications produced by this situation in Table II which also provides an introduction to the system of accounts which we propose to develop shortly. The example

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[1] Item III would include, e.g. income from endowments, but these could be « netted out » on the other side under Item VI.

given is only one of many which would demonstrate that any clear picture of financial structure requires a « de-consolidation » of Table I not only « horizontally, » but also « vertically » so that we are able to trace the flows between the various authorities concerned with educational finance.

29. Table II shows that there are *three groups of decision-makers* — the government sector, the private sector and the rest of the world — which can be further sub-divided. Secondly, it shows that these groups can perform four *activities*. They can be *users* of funds (as educational institutions actually purchasing goods and services to fulfil an educational programme). They can be *spending bodies* (who actually provide the educational institutions with funds). They can be *allocators of finance* (i.e. the equivalent of financial intermediaries who allocate to spenders out of funds raised in various ways). Finally, in the case of the private sector and the rest of the world, they can be *suppliers of finance* (i.e. the groups which deny themselves or are denied the use of resources permanently as in the case of taxpayers or temporarily as in the case of lenders in order for these resources to be transferred to educational use).

30. Table II only considers a simple case, but in considering the passage of funds from supply to use, we may encounter a bewildering variety of different sorts of transactions. Rather than represent these in our flow diagram, which would become inordinately complicated if we did, we may present these different kinds of transactions in matrix form (see Tables at the end of this Annex).

31. A number of points of general interest arise in attempting to use these tables. First of all, as we have already emphasised, while there is a fundamental distinction to be made between three groups of decision-markers — government, private sector and rest of the world — it may be both useful and important to use other sub-divisions than those illustrated in Table II. For example, in the case of West Germany, a finer division of public authorities appears necessary because the eleven *Länder* (States) including the Stadtstaaten (City states, e.g. Hamburg) and the *Gemeinden* (local communities) as well as the *Bund* (Federal Government) play a significant part in educational provision. It may often be difficult to place a particular institution in the right box, e.g. for certain purposes it may be advisable to include nationalised industries in the *enterprise* sector but for others it may not.

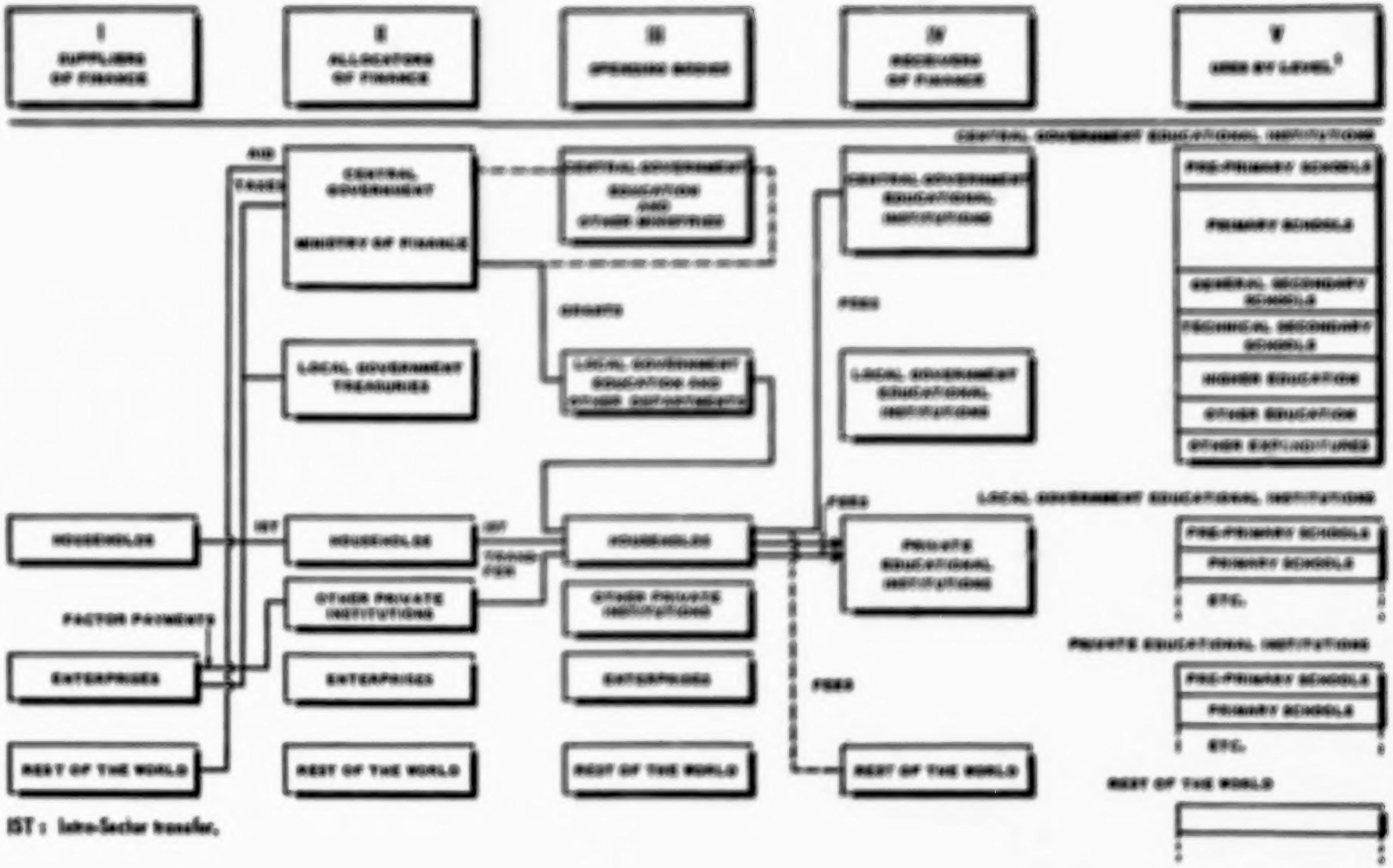
32. When we turn from decision-makers themselves to their activities, we may certainly find it difficult to separate out their functions as allocators and spenders from their activities as users. Conceptually, it is easy to distinguish the function of an enterprise as a benefactor of education from its function as a buyer of educational services, such as research, and as a « producer » of education as in the case of « on-the-job » training. Whether these distinctions are capable of being illustrated statistically is another matter. Possibly a more important example is when the « plant », i.e. the educational institution, is not the « firm, » i.e. the decision-maker on educational policy a case we have already illustrated in another way by reference to accounting control (cf. paragraph 12). This may make it impossible to do more than maintain a national distinction in some cases between « spending bodies » and « users. »

33. This takes us to a final set of problems associated with the *transactions* which link the various activities. If, for example, the same sector (and even in the case of households the same individual or family) carries out all the activities then some of the flows are rather fictitious. A case in point is the first illustration paragraph 28 the family paying all the fees for a student entering a university which relies solely on this source of income. It is obviously rather artificial to regard the household as a body which pays the fees over to itself as allocator and then over to itself as spender. The same artificiality obtains in the case of a firm which wishes to give a grant to itself as an educational institution providing on-the-job training. In this case the funds supplied never leave the firm at all and may be very hard to identify. That part of a craftsman's wage representing his services as a « teacher » of apprentices may be impossible to determine except in an arbitrary way. Nevertheless, so long as funds shift at the various stages from supply to use from one set of decision-makers to another, then fictions of the kind described are a small price to pay for clarity in the delineation of flows. A final and related problem concerning transactions related to those which take place between private suppliers and the fiscal authorities. There may be taxes which are earmarked for educational purposes but where these exist these are likely to be a small proportion of total revenue. In most cases, while we can specify the amount the government must raise to meet its educational commitments, it is impossible to associate particular taxes, particular tax payers, or particular compositions of tax revenue with the finance of education. This suggests that the « tax flow » should be simply a balancing item which is exactly offset by spending out of taxation by central and local governments. The same problem applies in the case of government borrowing which may not be tied to specific expenditure requirements.

34. One special problem has been left over for separate discussion. Student support in order to receive education is not confined to paying fees but also to the provision of subsistence. This will only appear in the system of accounts if it takes the form of « indirect » transfers for non-educational services, e.g. health services, canteens, accommodation, which are carried out in education establishments. Stipends for students in the form of « direct » transfers have to be treated as outside the scope of the accounts or as a « flow » from the relevant allocating body to households which has no counterpart by way of a receipt by the « users » of finance. The funds « disappear » as it were, into the tills of those outside the educational system providing accommodation, clothing, books, etc. for students. This raises two general points, one theoretical, one practical. The theoretical one is whether or not there is any point in making every column of accounts total to the same amount. This does not seem to be absolutely necessary, although it may complicate the matrix presentation. The practical one is whether or not the provision of student grants for subsistence should be included at all.

The pragmatic answer must be yes, if only because those who supply educational finance are normally in control of such grants which, in any case, are tied to provision of education. On the other hand, this may make international comparisons of educational expenditure even more misleading than usual because the costs of subsistence may be borne by a variety of different bodies, public and private, and in differing proportions. An easy

TABLE II


I
SUPPLIERS OF FINANCE
II
ALLOCATORS OF FINANCE
III
SPENDING BODIES
IV
RECEIVERS OF FINANCE
V
USE BY LEVEL¹
AID
TAXES
CENTRAL GOVERNMENT
MINISTRY OF FINANCE
CENTRAL GOVERNMENT EDUCATION AND OTHER MINISTRIES
GRANTS
LOCAL GOVERNMENT TREASURIES
LOCAL GOVERNMENT EDUCATION AND OTHER DEPARTMENTS
CENTRAL GOVERNMENT EDUCATIONAL INSTITUTIONS
FEES
LOCAL GOVERNMENT EDUCATIONAL INSTITUTIONS
PRIVATE EDUCATIONAL INSTITUTIONS
HOUSEHOLDS
IST
TRANSFER
OTHER PRIVATE INSTITUTIONS
FACTOR PAYMENTS
ENTERPRISES
REST OF THE WORLD
CENTRAL GOVERNMENT EDUCATIONAL INSTITUTIONS
PRE-PRIMARY SCHOOLS
PRIMARY SCHOOLS
GENERAL SECONDARY SCHOOLS
TECHNICAL SECONDARY SCHOOLS
HIGHER EDUCATION
OTHER EDUCATION
OTHER EXPENDITURES
LOCAL GOVERNMENT EDUCATIONAL INSTITUTIONS
PRE-PRIMARY SCHOOLS
PRIMARY SCHOOLS
ETC.
PRIVATE EDUCATIONAL INSTITUTIONS
PRE-PRIMARY SCHOOLS
PRIMARY SCHOOLS
ETC.
REST OF THE WORLD

IST : Intra-Sector transfer.

TABLE III. SUPPLIES OF FUNDS TO ALLOCATORS OF FINANCE

	CENTRAL GOVERNMENT MINISTRY OF FINANCE	LOCAL GOVERNMENT	HOUSEHOLDS	ENTERPRISES	OTHER PRIVATE INSTITUTIONS	REST OF THE WORLD
HOUSEHOLDS :						
Taxes						
Purchases of Goods and Services						
Transfers						
Loans						
ENTERPRISES :						
Taxes						
Purchases of Goods and Services						
Interest and Dividend Payments						
Transfers						
Loans						
REST OF THE WORLD :						
Payments of Interest and Dividends						
Transfers						
Loans						

TABLE IV. ALLOCATION OF FUNDS TO SPENDING BODIES

	CENTRAL GOVERNMENT		LOCAL GOVERNMENT		HOUSEHOLDS	ENTERPRISES	OTHER PRIVATE INSTITUTIONS	REST OF THE WORLD
	MINISTRY OF EDUCATION	OTHER MINISTRIES	EDUCATION DEPARTMENTS	OTHER DEPARTMENTS				
CENTRAL GOVERNMENT :								
Grants								
Loans								
Transfers								
LOCAL GOVERNMENT :								
Grants								
Loans								
Transfers								
HOUSEHOLDS :								
Transfers								
ENTERPRISES :								
Grants								
Loans								
Transfers								
OTHER PRIVATE INSTITUTIONS :								
Transfers								
Loans								
REST OF THE WORLD :								
Transfers								

TABLE V. RECEIPTS FROM SPENDING BODIES

	Central Government Educational Institutions	Local Government Educational Institutions	Private Educational Institutions	Rest of the World
I. Central Government :				
1. *Ministry of Education* :				
a) Grants				
b) Purchases of Goods and Services				
c) Loans				
2. *Other Ministries* :				
a) Grants				
b) Purchases of Goods and Services				
c) Loans				
II. Local Government :				
a) Grants				
b) Purchases of Goods and Services				
c) Loans				
III. Households :				
a) Purchases of Goods and Services				
b) Loans				
IV. Other Private Institutions :				
a) Grants				
b) Purchases of Goods and Services				
c) Loans				
V. Enterprises :				
a) Grants				
b) Purchases of Goods and Services				
c) Loans				
VI. Rest of the World :				
a) Grants				
b) Purchases of Goods and Services				
c) Loans				

TABLE VI. CLASSIFICATION OF EXPENDITURE BY DOMESTIC USERS OF FUNDS

	Purchases of Goods and Services				Interest on Debt	Repayment of Loans
	Current		Capital			
	Wages and Salaries	Other	Gross Fixed Capital Formation	Purchase of Stocks		
Central Government Educational Institutions						
Local Government Educational Institutions						
Private Educational Institutions						

Table VII. INSTITUTIONAL CLASSIFICATION OF EXPENDITURE BY DOMESTIC USERS OF FUNDS

	PRE-PRIMARY	PRIMARY	GENERAL SECONDARY	TECH. SECONDARY	HIGHER EDUCATION	OTHER EDUCATION	OTHER EXPENDITURE
Central Government Institutions Local Government Institutions Private Educational Institutions							

Table VIII. FUNCTIONAL CLASSIFICATION OF EXPENDITURE BY DOMESTIC USERS OF FUNDS

	ADMINISTRATION	INSTRUCTION	RESEARCH	NON-EDUCATIONAL EXPENDITURE
Central Government Institutions Local Government Institutions Private Educational Institutions				

answer to this dilemma is to make a separate study of the finance of these costs as occasion demands.

V. Applications of the Accounts

35. We may distinguish two sets of policy applications of this system of accounts associated with what may be termed « macro-decisions » and « micro-decisions. » It is necessary to say something in general terms about the nature of these decisions in order to specify how they affect the system of accounts.

36. « Macro-decisions » are those which embody an appraisal of public educational expenditure alongside other alternative forms of both public and private expenditure, including private expenditure on education. This appraisal is obviously influenced by the general objectives of economic and social policy as instanced in the following series of questions.

i) Given the amount and form of education desired by the community, how is this to be translated into a division between public and private provision (an « allocation problem »), and into the ways in which education should be financed (an « equity » problem) ?

ii) How far should the amount and form of education be itself influenced by the desire to increase output per head (the « growth » problem), and to maintain stable prices, incomes and employment (the « stability » problem) ?

37. So far as the « allocation » problem is concerned, clearly we must have information about the relative importance of public and private provision. Data on private provision, even adopting a narrow definition of education, is very limited in most countries. This entails not only being able

to identify public and private producers of education, but in the latter case knowing in some detail the influence on size exerted by both private and public methods of support. A policy designed to alter the relative proportions of public and private provision must imply knowledge not only of the flows of income and expediture, but also the main decision groups identified with each flow. Hence our emphasis not only on the financial transactions in educational finance, but also on the classification of the transactors.

38. The fact that in many countries it is easy to establish that public provision is the dominant influence in education does not necessarily entail that the general taxpayer is the main provider of finance, in other words, the « equity » problem is not simply part of the more general problem of deciding who shall finance *total* government expenditure. Payment according to benefit received is still operative for some forms of education notably higher and technical education, if not for others, although payment may not necessarily have to be made in *full*. On the other hand the fact than an educational establishment is a private one, does not necessarily entail that in does not receive public support, either directly by current and capital grants, or indirectly through government grants paid to its pupils or students on condition that they attend it. In taking a view of equity, therefore, it *must* be known which organisation or group of individuals financed what, and how, and by how much. In any case the whole story cannot be told by looking at the « positive » flow of funds because of the important influence which tax policy may exercise on the ability to obtain access to education.

39. It is the « growth » problem which has attracted the most attention in connection with the expansion of education. There is clearly widespread support for the view that a policy which seeks to combine an accelerated rate of economic growth with the minimisation of capital inputs should seriously consider the claims of educational expansion vis-a-vis physical investment. We are not concerned with the technical arguments surrounding growth models which embody education as a form of « non-physical » capital input[1], but with their implications for the presentation of statistical data. What is required first of all is some measure of the contribution of education to the national product, i.e. the « net output » of education, and, secondly, some estimate of that part of the gross output of the educational sector which is « bought » in order to improve the production of future output rather than to provide immediate enjoyment or an improvement in the production of current output.

40. It must be admitted right away that the classification of accounts in section III does no more than identify the raw material that is necessary to assemble in order to perform the operation described in paragraph 39. However, it does not seem unreasonable to « contract out » of further development of the system of accounts to meet the requirements of growth policy, given that there are important conceptual problems to be solved in measuring the net output of education when a large part of education is not priced. Furthermore, economists do not even agree among themselves as to whether or not there is any sense in talking about an « investment compoment. » Until this problem is solved it is difficult to construct a satisfactory accounting system to deal with the problem.

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[1] These are considered in detail in *The Residual Factor Economic Growth*, OECD, Paris 1964.

41. The theory of fiscal policy has presented a whole range of possible effects on the level of incomes, prices and employment produced by changes in the amount and composition of government revenues and expenditure. In theory, therefore, our system of accounts can reveal a series of instruments from loans, grants and direct expenditures which could be used to help solve the « stability » problem. In practice, of course, the macro-decision which is concerned with the relative effectiveness, given a whole range of government objectives or, say, altering education expenditure as against other outlays may be a very difficult one to make. Nevertheless, the fact that education expenditure, taking all layers of government, is likely to be an important component of the total, marks it out as a candidate for scrutiny. It follows that the economic classification of expenditure will be particularly useful for fiscal policy purposes. (It may be worth mentioning in parenthesis that fiscal policy suggests an alternative economic classification, namely the classification of government expenditure on education in the forms of the industrial origin of the goods and services used. This will be important in countries in which input-output analysis is used as a method of tracing the « multiplier » effects of changes in government expenditure on particular sectors of the economy.)

42. At the micro-decision level, we may assume that the relation between education policy and government policy as a whole is a datum and that what we are concerned with is the detailed execution of educational policy. It is possible to think of a whole range of examples in which the system of accounts could be used at this level, but one major one must suffice. Public education authorities must have some projection of the *standard* of education at each level and of the *degree of access* to education for the relevant age-groups. This immediately suggests that a close watch has to be kept on the relative rates of growth in educational expenditure at different levels in order to achieve the correct balance of facilities which follow from the projections. Our accounts are therefore useful not only as historical records but also as a framework for educational projections translated into resource requirements. This same example presupposes that estimates are made of the relation between the « output » of education in terms of the numbers educated at different levels, and the « input » of resources, i.e. that production functions are specified for different forms and levels of education. Our accounts do not directly impinge on these studies of educational productivity because they are not presented in sufficient detail, but they help to provide the perspective necessary in deciding in which sectors to concentrate investigation. If this is so, then it is vitally important to employ the same definition of education and the same classification system of educational institutions for both studies of educational finance and of educational costs.

43. A final point needs to be made about the influence of policy-making on the accounting structure. By the very nature of the budgetary process, educational finance and expenditure is not determined by educational planners alone. This means that the system of accounts must be designed to reflect the requirements not only of Ministries of Education but also those of Ministries of Finance and/or Economic Affairs. While this chapter has attempted to reconcile possible conflicting interests, it is inevitable that different Ministries and different sorts of specialists within them — economists, statisticians, and educationalists — will assign different orders of prior-

ities to the development of a particular accounting structure and of any part of it.

VI. EDUCATION AS A COMPONENT OF NATIONAL INCOME AGGREGATES

44. There are two important activities registered in national income accounts — production and consumption. The contribution of any activity to *production* (Gross National Product or Income) is measured either by adding together all the factor payments (including undistributed factor income and depreciation) and expressing them as proportion of Gross National Income or by subtracting from the gross value of sales by the « activity, » all purchases from other producing sectors and the value of imports. In the case of *consumption* it is usual to consider what proportion of total annual resources available are « used up » by the consumer, classifying these resources as the value of current purchases on the one hand and of capital purchases (physical investment + increase in stocks) on the other.

45. Taking the first of these measures, we immediately run into an important snag. As a large part of education services is not likely to be priced, the determination of the « net output » of education by the deduction of intermediate purchases from the value of gross output is not possible. This is normally a consequence of the fact that education is operated as a public service. The procedure which is normally followed in measuring net output of public services is simply to take the factor payments to public servants, i.e. we measure output by taking the value of factor inputs of labour. However, the same procedure if applied to private educational institutions who « sell » education, would lead to the omission of the value of other factor inputs such as profits, distributed or undistributed, interest payments and rent. It could be argued that there are equivalent factor payments in the public sector. In national accounts, it is common to impute a rent to government buildings, including educational ones, and part of the interest payments on public debt might be regarded as the counterpart to debenture interest. The difficulty is that imputation involves arbitrariness in valuation, more particularly in the case of public buildings, and even if we could reasonably assign a portion of public debt interest payments to our total of factor payments, we face the added difficulty that such interest payments are normally regarded as transfer payments and not as part of the national income.

46. It would be readily understood if Ministries of Education were sceptical of the value of developing a procedure for measuring net output. However, it may still be useful to show how one might produce an approximation to a total of factor payments in education which could be compared with total factor payments (national income) in any economy :

Factor Payments in Education

1. Wages and Salaries paid by educational institutions [item V *a*) *i*), Table I], *less* Wages and Salaries attributable to « non-educational » activities of educational institutions.
2. Imputed rents of educational buildings owned by private institutions and government *less* imputed rent attributable to « non-educational » use of buildings.

3. Rents, interest and profits (distributed and undistributed) of private educational institutions.
4. Actual and imputed value of factor services of individuals and « non-educational » institutions providing educational services.
5. Total.

47. If under 4, are included items such as housewives' services as educators which are not normally valued for the purpose of national income calculations, then these have to be added to the national income total when comparisons are made with it.

48. Taking the second measure — the proportion of the annual output of resources used up in education — we encounter more difficulties. Investment in fixed capital and in stocks presents no conceptual problem, but the same is not the case with current expenditure on goods and services [Item V *a)* Table I]. Purchases of current goods and services by the private education sector are either components of Gross National Expenditure *or* inter-industry payments *or* imports, the last two items not being components of the GNE. On the other hand, similar purchases by the government are all treated in the national income accounts as components of GNE because the government is generally treated as a final buyer. Lumping all current purchases, state and private, together and expressing them as a proportion of GNE is, therefore, illegitimate.

⁂

Appendix

ASSEMBLING DATA FOR THE ACCOUNTS

SUMMARY AND CONCLUSIONS

1. In this appendix, an attempt is made to apply the principles of accounting outlined in the previous chapter using the French educational system as examples. The point of this exercise is not to arrive at any comprehensive set of accounts, but rather to show what can be done with the *existing* information available in easily accessible sources, given limitations both in the time and statistical expertise available. Such an exercise simulates conditions which will be thoroughly familiar to hard-pressed statistical departments willing but possibly not able to undertake major readjustments in their activities. An important by-product of the exercise is that it may provide an agenda for future research if only because it reveals where the statistical gaps are to be found.

2. One clear outcome of this preliminary attempt at data gathering is that very little is known about the transfers of funds between the « suppliers of finance, » the « allocators of finance » and the « spending bodies. » The situation is rather better with regard to the flows between « spending bodies, » « receivers of finance » and « final uses of funds. » At all stages very little is known about private sources and private uses of educational funds.

3. Another factor which has emerged from these preliminary attempts to complete the tabulations is that financial data is almost inevitably collected

in accordance with the institutional and administrative structure of education. Whereas pupil statistics *can* be presented in a way that is relatively independent of the administrative structure (e.g. in terms of pupils' ages) and teachers can often be classified according to the pupils they teach, financial information follows very closely the precise administrative arrangements. It makes international comparisons, except at a very highly aggregated level, extremely difficult. This is an area, in fact, where strictly comparable international data can at best provide a jumping-off point for more detailed studies and comparisons of particular issues.

DATA ON EDUCATIONAL EXPENDITURE AND FINANCE IN FRANCE IN 1963

4. As stated above this appendix attempts to apply the principles of financial flows in education on the basis of information available in France for the year 1963. The aim is to show what can be done, with some effort, with this information in a limited amount of time. It should provide a general picture of the present situation and help to show up some of the deficiencies in the existing information. This can in itself by emphasising the fields in which data collection is at present inadequate, help to provide a guide to future research needs. Most of the data have been taken from various reports of the SEEF (Service des Etudes Economiques et Financières) which, using an economic and functional classification, has collected information about government expenditure on education as well as some data about private expenditure on education.

5. Diagram A I shows all the financial flows from source to use. A series of double entry matrices give a more detailed picture of the successive stages in these flows.

6. This presentation helps to bring out certain points concerning the respective role of the different bodies contributing to the financing of educational establishments run by central government, local government or private bodies.

7. Taking first the « Receivers of Finance » it will be seen that nearly 90 per cent of the total expenditure on education is borne by the public (Sector and local government) and a little over 10 per cent by the private sector. The share of the local authorities in this total is about 15 per cent.

8. By considering the relationship between « spending bodies » and « receivers » a more accurate picture of the real incidence is obtained. Thus about one third of the budget of private educational establishments is financed by the Ministry of National Education, and represents the salaries of teachers in private schools which have some kind of agreement with the State. The greater share of the remaining resources of the private sector consists of school fees paid by families (about 59 per cent). To this sum may be added, in unspecified proportions, grants, subsidies, the apprenticeship tax paid to technical education establishments, firms' financing of their own schools, accounting in all for less than 7 per cent of the private educational revenue.

9. As in the case of private education, the State partly finances schools run by the local authorities. In principle, the local authorities (communes) bear the costs of primary education and the day school sections of the

local lycées ; the State is therefore responsible for higher education, the day school and boarding sections of the national lycées, apprenticeship centres, State technical schools and the boarding sections of the local lycées. This rule is, however, being amended since the burden of the local authorities is becoming too great. (Table A. II indicates the distribution of the costs between the central and local government according to the various types of expenditure and shows how some of these costs overlap.) In addition, the State pays all wages and salaries earned in public education. The investment expenditure incurred by the communes on their own responsibility is largely financed by State funds (the commune however provides the land).

10. The « Education » budget of the local authorities regarded as « spending bodies » does not therefore reflect the entirety of the expenditure incurred by the schools run by the latter nor does it show how much of their own funds they spend on education. To know the « Education » budget of the local authorities it is necessary to stand at the level of the « allocators of finance. » Thus in a total expenditure by local authorities of F 2,632 million (i.e. 17.7 per cent of all educational expenditure), only F 1,910 million (12.8 per cent of all educational expenditure) is contributed by the local authorities out of their own funds. However, these percentages have only a relative value as expenditure on salaries and wages is not included in the calculation.

11. It is the State budget therefore which finances the greater share of education costs, i.e. some 77 per cent, the Ministry of National Education covering almost the whole of this outlay. The remainder of the cost is borne by the other ministries and by the special accounts of the Treasury. Of the other ministries, the one most directly concerned is the Ministry of Agriculture which finances agricultural schools of all levels. Other ministries too have educational commitments : for example, the Ministry of Industry in respect of the Ecoles des Mines, the Ministry of Public Works and Communications for the merchant navy schools and the Ministry of Defence for certain schools including the Ecole Polytechnique.

12. Insofar as they are ascertainable the funds placed at the disposal of State educational establishments by households and enterprises are negligible. Education is thus almost entirely financed from taxes. Direct taxes (F 23,199 million, i.e. 25.5 per cent of total tax revenue) are shared between households and enterprises in proportions of 64.8 per cent and 35.2 per cent respectively (i.e. 16.6 per cent and 9 per cent of total tax revenue). The great variety of indirect taxes makes it impossible to evaluate the respective shares paid by households and enterprises, although it is known that the latter's share is not less than 37 per cent of total tax receipts.

13. The other items considered, namely « other private institutions » and « rest of the world, » play a very small part in the financing of French education and one which is difficult to evaluate. On the other hand, the « rest of the world » merits the status of « Receiver, » seeing that the Ministry of National Education assumes certain education costs abroad.

14. The heading « use, » calls for some comments in addition to those inspired by the observations made previously in connection with the burdens of educational financing.

15. « Public sector education » covers the expenditure incurred by establishments at higher, secondary and primary level as well as expenditure on other items entered in the budget of the Ministry of National Education but not directly related to education. Expenditure of this type incurred by other ministries or the local authorities has not been taken into account : for example, the heading « scientific research » concerns only the expenditure incurred by the Ministry of National Education. These other items are basically Administration of Education, School and Municipal Libraries, school and university health services, physical education and sport in and out of schools, scientific research, and a few items connected with education abroad. At « Receiver » level these items have been grouped under the heading « Administration and miscellaneous expenditure. » It is obvious that some of the items mentioned above include educational outlay which should in consequence be added to expenditure at each level. However, the data available were not precise enough to allow a detailed breakdown and a corresponding apportionment of costs.

16. In this manner it is possible to isolate direct educational expenditure and approach the question of unit costs by educational level. However, in the example considered, the only significant assessment is that of unit costs at primary level. For 1963, no distinction is drawn between current expenditure in technical secondary education and general secondary education and this makes it difficult to calculate differentiated unit costs. The problem is the same in the case of higher education where aggregate figures only are available whereas it would be preferable to estimate unit costs by discipline.

17. Statistics for private education are less accurate than those for public education. This is due mainly to the fact that the assessments in question are obtained from spot checks or sample surveys. Moreover, salaries and wages and current purchases being grouped together for all educational levels, it is not possible to estimate the cost per student.

18. If one now considers the breakdown by function of educational costs, it will be seen that salaries and wages amount to 63 per cent of the total cost involved. Fixed asset formation accounts for 22 per cent. The remainder is shared between current purchases (11 per cent) and social expenditure (4 per cent). Because of the financing rules observed, fixed asset formation is borne principally by the budget of the Ministry of National Education and by local authorities.

19. Very slight differences may also be seen between the Ministry's budget and actual expenditure. These discrepancies derive from the fact that some items of expenditure for 1962 were carried over to 1963 with the result that, for some chapters, the outgoing in 1963 exceeded the estimates of the finance bill ; for other chapters, however, the budget as estimated was not entirely used up.

20. We would not claim that Table A. 1 can be used directly, but it does show quite clearly the flows of funds from sources to users. To obtain a more detailed picture of financial flows, it is necessary to use the double-entry matrices.

21. The preparation and consideration of the matrices gives a clearer picture of the overlapping of financial flows in the French system. This

TABLE A.1.

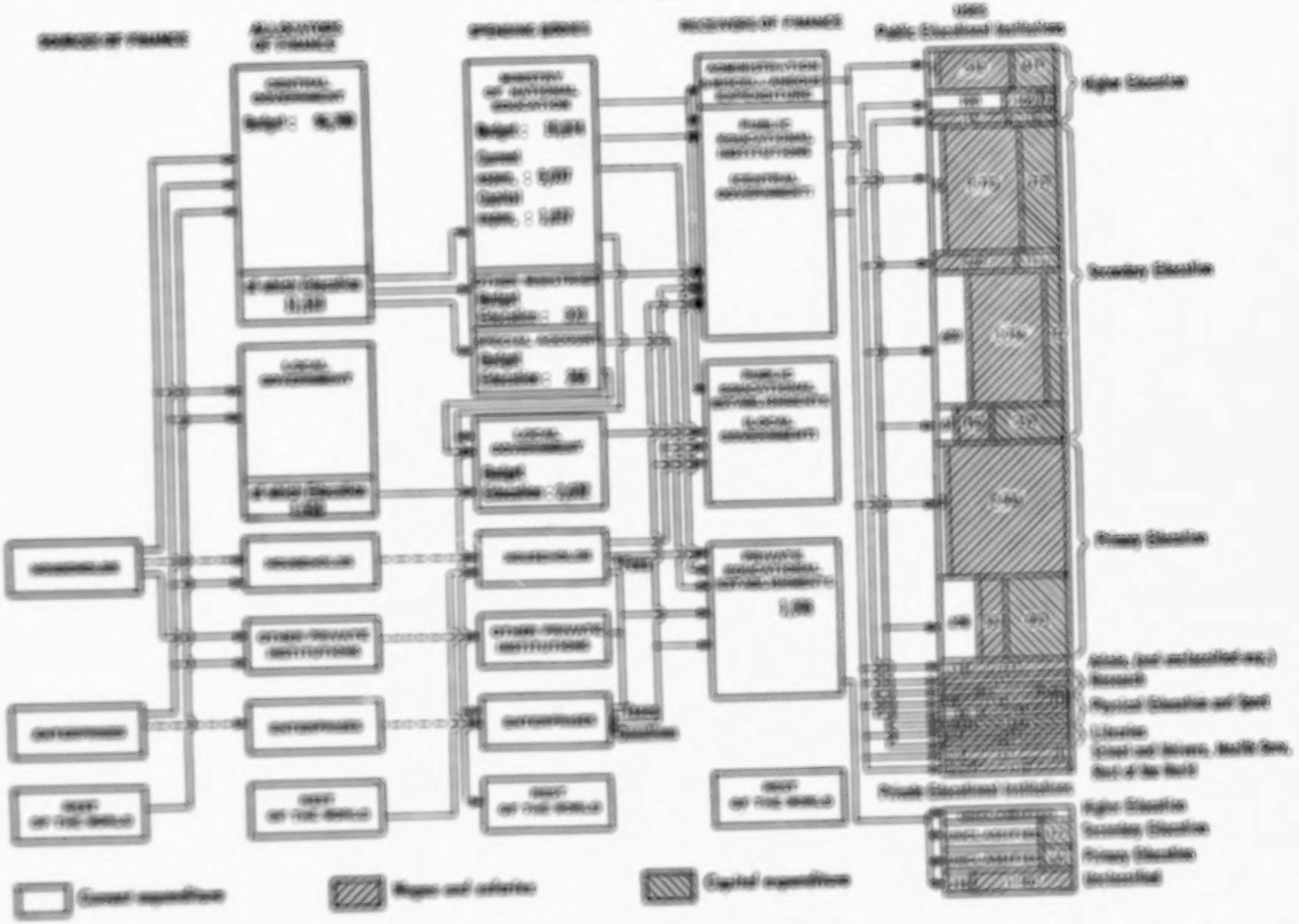
SOURCES OF FINANCE
ALLOCATORS OF FINANCE
SPENDING BODIES
RECEIVERS OF FINANCE
USES
Public Educational Institutions
Higher Education
Secondary Education
Primary Education
Research
Physical Education and Sport
Libraries
Private Educational Institutions
Higher Education
Secondary Education
Primary Education
Unclassified
Current expenditure
Wages and salaries
Capital expenditure

Table A.II. FINANCING OF PUBLIC EDUCATION

	CONSUMPTION	SALARIES AND FAMILY ALLOWANCES	GROSS FIXED CAPITAL FORMATION	LAND
Higher Education (Public Establishments)	E	B e (overtime)	B E (Mainly General maintenance, sometimes other work)	B E C
National Lycées / Nationalised Lycées (Public Establishments)	E	E e (overtime) e (Special Education)	B E (Cf. Higher Education)	B E C
Municipal Lycées / General Secondary Schools (C.E.G.)	C	B (Cf. Lycées) e	C	C
Technical Secondary Schools (C.E.T.) (Public Establishments)		E e (Special Education)	B E	B E C
Primary Schools	B e (ex.: text books) l (miscellaneous supplies)	B e (housing allowance) (Special Education)	C	C

N.B. B = State Budget.
E = Public Administrative Establishments of State.
C = Communes.
e = Local Establishments.
Source: SEEF.

has led us to amplify the presentation in order to make it more explicit and more consistent with the French system or, on the contrary, to simplify the flows when such simplification did not entail too many changes. Thus, in the matrices, transfers to public educational institutions have been grouped with payments.

22. The preparation of the matrices likewise shows up the deficiencies in the statistics at our disposal. In particular, it seems that a series of flows that is known to exist cannot be calculated: either the data available are too general to allow of any detailed breakdown or special surveys would have to be made to determine their importance. Take, for example the question of loans: we have no information about loans contracted by private educational institutions and none available immediately on loans secured by the public authorities and in particular by local authorities. All

the more reason why transfers within the same sector — households, enterprises, for example — and transfers from « other private institutions » cannot be estimated.

23. In the case of the private educational sector other difficulties arise owing to the fact that this is a heterogeneous sector consisting of undenominational and denominational establishments that are independent of one another and, in some cases, independent of the State. Apart from enrolment statistics which are regularly compiled, other data, and in particular financial data, are not collected on a systematic annual basis. Surveys or enquiries have been made in certain branches and the results are generally extrapolated.

24. It thus appears that a classification of finance and expenditure more closely adapted to education needs to be devised. Such a classification would indicate the characteristics peculiar to the country considered and integrate them in the general framework outlined in Annex V.

TABLE A.III. SUPPLIES OF FUNDS TO ALLOCATORS OF FINANCE

Year 1963

Million F.

	CENTRAL GOVERNMENT MINISTRY OF EDUCATION	LOCAL GOVERNMENT	HOUSEHOLDS	ENTERPRISES	OTHER PRIVATE INSTITUTIONS	REST OF THE WORLD
I. HOUSEHOLDS :						
Taxes } direct	23,199					
Taxes } indirect	n.a.	n.a.				
Purchases of Goods and Services			x[1]			
Transfers						
Loans						
II. ENTERPRISES :						
Taxes } direct	8,159					
Taxes } indirect	n.a.	n.a.				
Purchases of Goods and Services						
Interest and Dividend Payments						
Transfers				x[1]	n.a.	
Loans		n.a.				
III. REST OF THE WORLD :						
Payments of Interest and Dividends						
Transfers			n.a.			
Loans						
Total (I + II + III)	96,700	n.a.				

[1] Intra sector transfers.

TABLE A.IV. ALLOCATION OF FUNDS TO SPENDING BODIES

Year 1963

Million F.

	CENTRAL GOVERNMENT		LOCAL GOVERNMENT		HOUSEHOLDS	ENTERPRISES	OTHER PRIVATE INSTITUTIONS	REST OF THE WORLD
	MINISTRY OF EDU-CATION	OTHER MINIS-TRIES	EDU-CATION AUTHORI-TIES	OTHER AUTHORI-TIES				
CENTRAL GOVERNMENT :								
Grants								
Loans								
Transfers	10,676	639						
LOCAL GOVERNMENT :								
Grants								
Loans								
Transfers			1913					
HOUSEHOLDS :								
Transfers					x[1]			
ENTERPRISES :								
Grants								
Loans								
Transfers						x[1]		
OTHER PRIVATE INSTITUTIONS :								
Transfers							x[1]	
Loans								
REST OF THE WORLD :								
Transfers								

1. Intra Sector Transfers.

TABLE A.V. RECEIPTS FROM SPENDING BODIES

Year 1963

Million F.

	TRANSFERS BETWEEN SPENDING BODIES				[illegible]	[illegible]	[illegible]	[illegible]
	Local Government	[illegible]	[illegible]	Rest of the World				
I. CENTRAL GOVERNMENT :								
1. *Ministry of Education :*								
a) Grants	1,236	134	10	26				
b) Purchases of Goods and Services					9,236		314	
c) Loans								
2. *Other Ministries :*								
a) Grants	196				273		70	
b) Purchases of Goods and Services						2,682		
c) Loans								
II. LOCAL GOVERNMENT								
a) Grants								
b) Purchases of Goods and Services								
c) Loans					221	n.a.	893	
III. HOUSEHOLDS :								
a) Purchases of Goods and Services								
b) Loans								
IV. OTHER PRIVATE INSTITUTIONS :								
a) Grants								
b) Purchases of Goods and Services								
c) Loans								
V. ENTERPRISES :								
a) Grants								
b) Purchases of Goods and Services								
c) Loans								
VI. REST OF THE WORLD :								
a) Grants								
b) Purchases of Goods and Services								
c) Loans								

Table A.VIa. CLASSIFICATION OF EXPENDITURE BY DOMESTIC USERS OF FUNDS

Year 1963

Million F.

	PURCHASES OF GOODS AND SERVICES				INTEREST ON DEBT	REPAYMENT OF LOANS	TOTAL
	CURRENT		CAPITAL				
	WAGES AND SALARIES	OTHER	GROSS FIXED CAPITAL FORMATION	INCREASE IN STOCKS			
Central Government Educational Institutions	7,620.1	875.7	1,630.4		n.a.	n.a.	10,126.2
Local Government Educational Institutions	670	576	1,386		n.a.	n.a.	2,632
Private Educational Institutions	1,320		188		n.a.	n.a.	1,508

Table A.VIb. INSTITUTIONAL CLASSIFICATION OF EXPENDITURE BY DOMESTIC USERS OF FUNDS

Year 1963

Million F.

	PRE-PRIMARY	PRIMARY	SECONDARY GENERAL	SECONDARY TECHNICAL OR VOCATIONAL	HIGHER EDUCATION	OTHER EDUCATION	OTHER EXPENDITURE	TOTAL
Central Government Institutions	2,557.7		5,451.6		1,294.2	n.a.	829.1	10,126.6
Local Government Institutions	1,778		606		28		220	2,632
Private Educational Institutions	61[1]		127[1]		negligible		1,320[2]	1,508

1. Capital expenditure only.
2. Current expenditure by educational level and other expenditure.

Table A.VIc. FUNCTIONAL CLASSIFICATION OF EXPENDITURE BY DOMESTIC USERS OF FUNDS

Year 1963

Million F.

	ADMINISTRATION	EDUCATION PROPER	RESEARCH	NON-EDUCATIONAL EXPENDITURE	TOTAL
Central Government Institutions	240.2	9,297.9	317.5	271	10,126.6
Local Government Institutions	negligible	2,412	—	220	2,632
Private educational Institutions	negligible	1,508	—	negligible	1,508

TABLE A.VI*d*. CLASSIFICATION OF PUBLIC AND PRIVATE EDUCATIONAL EXPENDITURES BY TYPE OF EXPENDITURES AND LEVEL OF EDUCATION

Year 1963

Million F.

	PUBLIC EDUCATIONAL INSTITUTIONS			PRIVATE EDUCATIONAL INSTITUTIONS			TOTAL
	WAGES AND SALARIES	OTHER CURRENT EXPENDITURE	INVESTMENT EXPENDITURE	WAGES AND SALARIES	OTHER CURRENT EXPENDITURE	INVESTMENT EXPENDITURE	
Pre-Primary	3,892	501	497			65	
Primary Education							
General Secondary Education	3,962	696	1,444			123	
Technical Secondary Education							
Higher Education	634	191	497				
Other Education							
Other Expenditure :							
— Administration and unclassified Expenditure	223	17		1,102[1]	218[1]		
— Scientific Research	227		40				
— Physical Education and Sport	392	39	171				
— Non-School Libraries	71	2					
— School and University Health Services	38	5	1				
— Rest of the World	1.5	0.5					

NOTE : (1) Administration and Unclassified Expenditure.

Annex VI

NOTES ON THE CLASSIFICATION OF UNIVERSITY DEGREE SUBJECTS IN THE UNITED KINGDOM[1]

CLASSIFICATION OF UNIVERSITY DEGREE SUBJECTS

1. A new standard subject classification has been prepared for use in the collection and presentation of statistics relating to university degrees and diplomas, including higher degrees and diplomas, external degrees, and awards of the Council for National Academic Awards. The classification may be applied both to the qualifications awarded and the courses of study leading to them.

2. The classification has been evolved, in consultation with other departments and bodies, from a study of a number of classifications previously in use : those in use in the United Kingdom for purposes of education statistics and statistics of highly qualified manpower, and the classifications recommended by UNESCO and OECD. A main objective of the new subject classification has been to make provision for qualifications and courses embracing a combination of two or more subjects (see paragraphs 8 to 11).

3. Parallel with this, a new subject classification has been prepared which will be applicable to courses in further education establishments leading to other recognised qualifications. Its main structure conforms closely to that for university degree courses.

4. The classification for university degree courses provides for 10 main *subject groups*, viz.

1. education ;
2. medicine, dentistry and health ;
3. engineering, technology and applied sciences ;
4. agriculture, forestry and veterinary science ;
5. pure science ;
6. social, administrative and business studies ;
7. architecture and other professional and vocational subjects ;
8. language, literature and area studies ;
9. arts other than languages ;
10. music, drama and visual arts.

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[1] This paper, which has been made available by the Department of Education and Science, is presented to illustrate a means by which the problem of classifying higher qualifications by subject can be approached. It illustrates the complexity of the field, and no doubt underlines the problems of international comparisons in this domain.

For more detailed classification further subdivision into 74 *primary subjects* is provided, as shown in detail in the table at the end of this Appendix. The table also lists, as *secondary subjects*, other subjects which are considered to fall within primary subjects. Only the most common secondary subjects are listed. A fuller list of these secondary subjects is being compiled — to assist, in particular, in classifying postgraduate studies.

5. The designation of most of the subject groups is self-explanatory. First degree courses in subjects of a direct professional or vocational nature — frequently based on combinations of the more traditional academic subjects — are becoming more common. The subject group 7. « Architecture and other professional and vocational subjects » has been included, therefore, to allow for such subjects falling outside the fields covered in other subject groups, e.g. 1. to 4.

6. The title of a degree is not always a direct guide to the subject of study and it is ignored for subject classification purposes if it does not accurately reflect the subject content of the course. For example, a BSc (Econ.) degree in which the main subject of study is sociology is classified under « Sociology » not « Economics. »

7. The subject, or subjects, by which a first degree is classified are the *main* subject or subjects of study. Subjects studied at subsidiary level are not considered. Some degree courses, for example in Scottish and Northern Ireland universities, require study in four or five subjects. This type of degree is classified by the two (or more) subjects studied for more than one year during the degree course.

COMBINATIONS OF SUBJECTS

8. The present subject classification makes provision for qualifications and courses embracing a combination of two or more subjects. In this connection a distinction may be drawn between *i*) a pair of subjects studied *simultaneously* within a degree course and *ii*) a pair of subjects studied *sequentially*. In a subject classification of students or of qualifications awarded during a year only « simultaneous » combinations have to be considered, whereas in a subject classification of highly qualified manpower provision has to be made for both « simultaneous » and « sequential » combinations.

9. The number of possible combinations of subjects is so large that, with a classification of under 100 primary subjects, a great deal of bracketing of combinations within one primary subject is inevitable. Consequently, if detailed information on combinations is required, classification to the secondary subject level (running to several hundred items) is necessary.

10. Certain basic principles have been followed in the classification of combinations of subjects :

i) When the two or more subjects studied are secondary subjects within *the same primary subject*, the degree has been classified as a separate secondary subject within the particular primary subject ; e.g. economics/economic history is classified within economics.

ii) When the two or more subjects studied are primary or secondary subjects *within the same subject group*, but not within the same primary subject, then, if the number of students on the courses warrants it, an additional primary subject has been formed within the subject group, e.g. there is an additional primary subject in the social, administrative and business studies subject group for combinations such as sociology/politics and business studies/psychology.

iii) When the two or more subjects studied are primary or secondary subjects *in different subject groups*, then, if the number of students on the courses warrants it, an additional primary subject has been formed within one of the subject groups, e.g. there is an additional primary subject in the social, administrative and business studies subject group for combinations such as economics/politics/history and sociology/English/history.

iv) Combinations not covered by *i)* to *iii)* above are classified to whichever primary subject of the combination first appears in the list of primary subjects in the table at the end of this appendix. For example, forestry with chemistry would be classified under « Forestry. » Similarly, agriculture with forestry would be classified under « Agriculture. »

11. Special treatment of combinations applies in the following cases :

i) Archaeology/anthropology and Archaeology/ancient history included under « Archaeology. »

ii) Combinations of classics with philosophy are included under « Classical studies, » e.g. Latin/philosophy, Greek/philosophy, and classics/philosophy.

iii) Architecture/fine art included under « Art and design. »

iv) Statistics/physics included under « Mathematics/physics. »

v) Philosophy/physiology/psychology included under « Psychology. »

CLASSIFICATION OF UNIVERSITY DEGREE SUBJECTS

SUBJECT CLASSIFICATION

NOTE : A stroke symbol / means « combined with »

SUBJECT GROUP	PRIMARY SUBJECT	SECONDARY SUBJECTS	
		SINGLE SUBJECTS	MULTIPLE SUBJECTS
1. Education	Education	Physical education	
	Combinations of education with any other subject		Education/English Education/history Education/mathematics
2. Medicine, dentistry and health	Medicine	Surgery Pathology (medical) Medical bacteriology	
	Dentistry		
	Pharmacy	Pharmacology	
	Ancillary health subjects	Environmental health Nursing Nutrition	
3. Engineering, technology and applied science	Aeronautical engineering	Aeronautics Astronautics	
	Chemical engineering and technology	Gas engineering Fuel technology and engineering Petroleum and oil technology and engineering	Fuel technology/chemical engineering
	Civil engineering	Building and building science Structural engineering	
	Electrical engineering	Applied electronics Electronic engineering	
	Mechanical engineering	Agricultural engineering Automobile engineering Marine engineering	

	Mining	Mining engineering Minerals engineering and technology Mining geology	
	Metal technologies	Metallurgy Foundry technology	
	General and other engineering subjects, including combinations of engineering subjects	General engineering Engineering science Nuclear engineering and technology Control engineering	Mechanical/electromechanical engineering
	Surveying	Geodesy Quantity surveying	
	Applied biology	Applied biochemistry	
	Applied chemistry	Technical chemistry Colour chemistry Polymer chemistry	
	Applied physics		
	Other technologies and applied sciences (including combinations of technologies and/or applied sciences, or of technologies or applied sciences with engineering)	Ceramics technology Food science and technology Glass technology Leather technology Materials technology Paper technology Plastics technology Rubber technology Textile technologies[5] Cybernetics	
	Combinations of any subjects in subject group 7 with subjects in subject groups 8 to 10 inclusive		

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[5] In some cases these are described as « engineering » instead of « technology ».

Continued pages 310, 311 →

CLASSIFICATION OF UNIVERSITY DEGREE SUBJECTS (*Continued*)

SUBJECT GROUP	PRIMARY SUBJECT	SECONDARY SUBJECTS	
		SINGLE SUBJECTS	MULTIPLE SUBJECTS
4. Agriculture, forestry and veterinary science	Agriculture	Dairying Poultry Horticulture Agronomics Agricultural economics	
	Agricultural biology	Agricultural biochemistry Agricultural botany Agricultural zoology Soil science	
	Agricultural chemistry		
	Forestry		
	Veterinary science		
5. Pure science	Biology	Botany Zoology Anatomy Bacteriology[1] Biophysics Cytology Genetics Microbiology[1] Pathology[1] Physiology	Botany/zoology Bacteriology/zoology Biology/biochemistry Biochemistry/physiology
	Biochemistry	Medical biochemistry Biological chemistry Physiological chemistry	
	Chemistry		
	Mathematics	Applied mathematics Mathematical statistics Mathematical computer studies	Mathematics/statistics

		Astrophysics Electronic physics Nuclear physics Radio astronomy	
	Geology	Geophysics Mineralogy	
	Other environmental sciences	Meteorology Oceanography	
	Mathematics/physics		Statistics/physics
	Combinations of physical sciences (other than mathematics/physics)[2]		Chemistry/geology Chemistry/mathematics Physics/chemistry
	Combinations of biological with physical sciences[2]		Biology/chemistry
	Combinations of any subjects in subject group 3 with subjects in subject groups 4–11 inclusive (excluding philosophy/physiology/psychology)		Zoology/geography Mathematics/social studies Mathematics/economics General science/philosophy
4. Social administrative and business studies	Economics	Economic science Economic statistics Economic history Industrial economics	Economics/statistics Economics/economic history
	Geography		
	Accountancy	Banking	

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1. Other than when orientated towards medicine, agriculture or veterinary science in which cases to be classified under medicine, agricultural biology or veterinary science respectively.

2. For the purposes of distinguishing physical sciences and biological sciences, biochemistry is treated as a biological subject. The combination biology/biochemistry is included under Biology. General science degrees should be classified to one of the two primary subjects representing combinations of subjects within the pure science subject group, according to the subjects studied.

Continued page 322, 323 →

CLASSIFICATION OF UNIVERSITY DEGREE SUBJECTS (*Continued*)

SUBJECT GROUP	PRIMARY SUBJECT	SECONDARY SUBJECTS	
		SINGLE SUBJECTS	MULTIPLE SUBJECTS
6. Social administrative and business studies (*continued*)	Business studies	Administration Commerce Estate management Application of computers to business Mathematics for business	
	Government and public administration	Politics Political science Government International relations	
	Law		
	Psychology		Philosophy/physiology/psychology
	Sociology	Social science Social administration Social statistics Criminology Industrial relations	
	Social anthropology		
	Combinations of any subjects within subject group (including secondary subjects within the same primary subject)		Economics/politics Economics/sociology Sociology/politics Economics/law Politics/law Economics/psychology Sociology/psychology Economics/geography Politics/geography Sociology/geography
	Combinations of subjects in subject group 6 with subjects in subject group 7		Economics/history Politics/history Economics/politics/history

			Politics/economics/philosophy Sociology/philosophy Sociology/English Psychology/English Geography/English
7. Architecture and other professional and vocational subjects	Architecture	Town planning Land use studies	
	Home, hotel and institutional management	Domestic science Home economics	
	Other professional subjects		
8. Language, literature and area studies	English	English language English literature American studies	
	Welsh and other Celtic languages and studies		
	French language and studies		
	German language and studies		
	Spanish language and studies	Hispanic studies Latin American studies Portuguese	
	Other Western European languages and studies, including combinations of Western European languages other than French/German		English/French English/German French/Spanish French/Italian
	French/German		
	Russian language and studies		
	Other Central and Eastern European languages and studies, including combinations of Central and Eastern European languages	Slavonic	

Continued page [illegible]

CLASSIFICATION OF UNIVERSITY DEGREE SUBJECTS (Continued)

SUBJECT GROUP	PRIMARY SUBJECT	SECONDARY SUBJECTS	
		SINGLE SUBJECTS	MULTIPLE SUBJECTS
6. Language, literature and area studies (continued)	Classical studies (including combinations of classics with philosophy)	Classics Ancient Greek Latin Hebrew Ancient history	Latin/Greek Classics/philosophy Classics/philosophy/ancient history Latin/philosophy Greek/philosophy
	Chinese and Chinese area studies		
	Oriental, Asian and African languages and studies other than Chinese, including combinations of Oriental, Asian and African languages		
	Other languages, literature and area studies	Linguistics Phonetics Philology	
	Combinations of any subjects within the subject group (excluding subjects within the same primary subject and French/German and combinations of subjects separately allowed for)		English/Latin French/Russian French/Latin German/Russian
	Combinations of subjects in this subject group with subjects in subject groups 5 and 10 (excluding combinations of classics with philosophy and of ancient his-		English/history English/philosophy English/drama French/history French/philosophy French/drama

			Archaeology/ancient history
	Philosophy	Moral sciences Logic	
	Theology	Bible studies	
	Arts general where subject content not specified; combinations of any subjects within this subject group (including subjects within the same primary subject); and combinations of subjects in this subject group with subjects in subject group 10		History/philosophy History/theology
10. Music, drama and visual arts	Art and design	History of art Fine art Textile design	Architecture/fine art
	Drama		
	Music		

1. Ancient history is included under Classical studies

Annex VIII

THE POSTCENSAL STUDIES PROGRAMME : BACKGROUND AND CONTENT

by

Norman Seltzer

National Science Foundation

1. The need for data on the Nation's resources of all types of manpower has become more urgent as an awareness grows that such information is vital in planning and evaluating many economic, educational, and scientific policies and programmes in all sectors of the economy. In particular, our concern regarding our resources of high-level manpower required to carry out the multitude of tasks in science and technology has been reflected in the National Science Foundation's programmes of scientific manpower studies.

2. The genesis of the Postcensal Studies Programme goes back to 1957 when the Foundation together with the President's Committee on Scientists and Engineers appointed a special advisory panel to review requirements for scientific manpower data. In its report[1] issued in 1958, this panel found, not surprisingly, that on the whole, data on the number, demand, supply, utilization, and other economic and social characteristics of scientific and technical personnel were not adequate for formulating policies and undertaking programmes related to the welfare and security of the Nation. Among the projects recommended as highly urgent was « a special survey of a large sample of persons recorded in the 1960 Census enumeration as college graduates or as persons currently or last employed in scientific and technical positions, whether college graduates or not, to determine relationships between training and subsequent occupations. » It was reasoned that the 1960 Census would provide a rare opportunity (not available again for possibly another 10 years) to obtain valuable data directly and efficiently from the individuals classified in scientific and technical occupations regarding their demographic, economic and social characteristics. In addition, by surveying all types of college graduates, regardless of occupation, comparable data would be provided on other highly trained personnel in other professions (such as law and medicine), in the humanities, in business, and in managerial and administrative positions in business and government as well as those currently not in the labour force.

3. With the knowledge that Census Bureau data processing would have

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[1] *A Programme for National Information on Scientific and Technical Personnel*, NSF, 58-28, National Science Foundation, 1958.

available by 1962 a tape with the occupational sample information, the National Science Foundation in 1960 began to consider the feasibility of undertaking such a major project, and requested that the National Opinion Research Center, affiliated with the University of Chicago, prepare a planning statement on a series of postcensal studies of scientific and professional workers and college graduates. A detailed planning statement was prepared which provided the initial basis for the proposed studies. During the first part of 1961, the Foundation, aware of the interests and missions of other Federal agencies, initiated a series of meetings with these agencies to acquaint them with the proposed studies and provide them with the opportunity to participate in, or co-sponsor the nation-wide survey under consideration. By late fall, 1961, four other Federal agencies — the U.S. Office of Education, National Institutes of Health, Bureau of Labour Statistics, and the Veterans Administration — had made definite commitments to participate in the survey and provide the necessary support.

4. Beginning in the spring of 1961, the National Opinion Research Center with the aid and consultation of the National Science Foundation and the Bureau of the Census began to develop a basic mail questionnaire which would be used as the primary survey instrument for the Postcensal Studies Programme. The remainder of this paper will discuss the content of the questionnaire and some of the possible uses of the data which we were seeking.

5. The availability of a large sample based on the entire population was very attractive bait for requesting information on an extremely wide variety of subjects which could well have covered numerous economic, demographic, sociological, and psychological areas. The temptation to run wild, so to speak, was held in check by the very obvious realizations that the burden imposed on the respondents might be such as to obviate any possible success in obtaining a meaningful rate of response. In addition, of course, was the fact that the Foundation's programme of manpower studies enables us to obtain data from a variety of sources, much of which would both complement and supplement data derived through the Postcensal Studies Programme. These manpower studies include among others, the National Register of Scientific and Technical Personnel, employment surveys of scientific and technical personnel in various economic sectors, follow-up studies of college graduates, and pilot efforts dealing with the labour market behavior and mobility of persons in selected occupations.

6. The content of the Postcensal Studies Programme can be reviewed in some detail through an examination of the survey questionnaire itself. Even with self-imposed limitations, the final version of the basic questionnaire ran to eight « fully-packed » pages with an additional sheet enclosed containing a list of pre-coded fields of specialization to be used in answering questions dealing with employment and training. For a small sample of persons in occupations in which the National Institutes of Health had particular interest, another one-page supplemental questionnaire was added dealing in detail with questions of financial support received by the respondent for both training and research purposes.

7. To begin with, among the main foci of interest were questions pertaining to the employment, occupation, and job activities of persons classified

in selected professional, scientific, and technical occupations during the 1960 Census. In the 1960 Census schedule, the amount of information available pertaining to a person's work activities is quite limited. In fact, the only direct questions deal with what a person does (in terms of an occupational classification) and what type of employer he works for. Even information collected by both Government and non-government organizations for studies dealing with job analysis or vocational guidance have provided largely some general outlines when dealing with professional and technical personnel. The occupational label used in classifying personnel such as « engineer, » « chemist, » or « college professor » actually covers persons in a wide range of specializations.

8. Therefore, we were interested in determining first, for the most current period possible, how many engineers, for example, were working in civil compared to nuclear engineering? how many chemists considered themselves to be in organic chemistry compared to physical chemistry? and, what fields college teachers considered their primary area of specialization? Beyond this, we were hopeful of obtaining some insight into the extent to which interdisciplinary work in science and technology has resulted in engineers working in an area of the physical or life sciences, physicists concerning themselves primarily with some aspect of the medical sciences, or mathematicians calling astronomy their field of work specialization.

9. Another equally important area of job information is the activities or duties that are actually performed; that is, what do people classified in professional and technical occupations of interest to us « really do » in their jobs. Most of our information in this area, up to the present time, comes from other surveys which give us only an indication of the functions in which an individual is primarily engaged; for example, the National Register and the employment surveys mentioned earlier. Although we may have some indication that a certain number of physicists may be involved in « research, » what the varied job requirements or duties of these personnel are, has not really been known. For some, this may mean that aside from engaging in applied research, the job may entail consulting customers on technical matters, coordinating a team of other professional personnel, and writing technical reports; for others, there may be administrative duties, and making estimates of markets for new products. For persons in other occupations, such as engineers, mathematicians, economists, and college teachers, there are of course a similar wide range of activities which make up the different types of jobs in which such personnel are engaged. In addition to obtaining an overview of the varied activities making up the jobs of professional and technical workers, respondents in the study were also requested to indicate which two activities were primary in the sense of most time being spent on them.

10. The organization of work in professional and technical occupations and the interpersonal relationships in the work environment is another area in which little information has been developed. Although in the past, the professional, in particular, was either self-employed or worked largely alone even when employed in an organization, the development of the professions and the complexities of scientific and technical work in an increasingly industrialized setting have resulted in considerable changes in the organizational environment. In order to obtain some understanding of this

environment, a series of questions were directed at the respondent regarding the size of organizational unit in which employed; the number of employees being supervised, if any; whether he works as part of a team, either with personnel from his own field of specialization or from others; whether he has an immediate supervisor, and if so, if the supervisor's field of specialization is similar to his.

11. If our knowledge concerning the current employment and job activities of professional and technical personnel has been rather limited, this has been even more so about the process over time by which such highly trained persons are allocated to various jobs and employers, the career paths which may characterize different professions, and the movement of professional and technical personnel between various employers, occupations, and work specializations. It was determined that some insight into this complex area would be helpful in dealing with an assortment of problems including the supply and demand of scientific and technical personnel. To this end, questions on employment and job activities were related to three points in time — current employment (e.g., mid-1962 when the survey schedules were sent out), April 1960 (the date of the decennial census when the persons in these occupations were originally enumerated), and the first full-time job held at age 25. It was obvious, of course, that such information could not provide complete work histories, but it would give us a broad overview of mobility patterns. For these time periods, it will be possible to analyse many factors in relation to changers and non-changers among the various occupational groups; for example, there are those who have always had the same occupation with the same employer; those who have changed employers one or more times but remained in the same occupation; those who have remained with the same type of employer and occupations but whose area of work specialization has shifted during their careers, etc.

12. What insights can be provided by such data? The period 1960-1962 has been marked by, among other things, an increase in vast Federal Government expenditures for research and development, a build-up of activities in both government and industry for the space programme, an increase in existing as well as new programmes for medical and health research, an increased emphasis on the development of new products in many science-oriented industries, and an expansion of college and university facilities to accommodate the influx of new students and provide for expanding research programmes. Against this background, the recent mobility data will provide an evaluation of the movement between employers, jobs, activities, and fields of specializations. For example, are more scientists moving from academic employers to industrial jobs than vice versa? Are a greater proportion of engineers concerned with administrative or supervisory duties than heretofore? Are certain industries attracting a higher proportion of the mobile personnel? Does there appear to be a shifting or upgrading of persons in non-professional jobs (the technician occupations) to professional occupations?

13. By going back to the age 25 starting point for job histories, it may be possible to establish typical and variant career histories for specific occupations and occupational groups, for respondents with specific levels and types of training, and for those with certain demographic characteristics.

Several additional general questions on employment which were included will provide some further insights into the overall work history patterns: respondents were asked to indicate all the different types of employers worked for; the number of different employers for the current field of work specialization as well as the total number of years worked in the present field of specialization; and finally, some data on the different fields of work specialization in which the respondent was engaged during his career other than those already indicated for the specific points in time requested.

14. Turning now to our third main area of inquiry — training — an intensive effort has been made to obtain a considerable amount of detail on various facets of both formal education and informal types of training. By and large, persons in the occupations covered in this survey have a fairly high level of training, especially when compared to the general population. Not only is some information in this area available from a variety of other studies, but we are also aware that the requirements for employment in these professional, scientific and technical occupations require this background — even more so in the past several decades.

15. To begin with, since information on training was obtained as of 1962, we were able to update the Census occupational information on number of years of formal training completed. However, our primary interest lay beyond this data, in that we wanted to determine some of the specifics of higher education obtained in relation to subsequent employment. Data was therefore requested on major fields of specialization for undergraduate and graduate study at every institution attended as well as the different types of degrees granted, where appropriate. As a subsidiary question, we requested information on sources of financial support received by respondents for undergraduate and graduate or professional training. This will provide some historical insights on the varied sources of support obtained by persons who received their training in different fields of study. In addition, because of our general knowledge that a substantial amount of training takes place outside of the formal educational system, several questions were included about informal types of training received, such as company training programmes, military training applicable to civilian occupations, home study correspondence courses, special workshops and seminars, etc. Some of the more apparent uses of this information include: a detailed description of the formal education and training of persons in various professional, scientific, and technical occupations; an analysis of current occupation and field of work specialization as well as overall job histories in relation to major fields of study at both undergraduate and graduate levels; the extent to which persons with less than a college degree are employed in professional occupations, and what types of informal training as well as experience may have contributed to their obtaining such positions; and, an analysis of the personal and other background characteristics of the respondent to determine whether any insight can be obtained regarding differences in levels of training and subject matter studied.

16. Lastly, as previously indicated, some information was sought on background and personal characteristics both to supplement data available from other sources and as factors to relate to data obtained in the areas dealing with employment and training.

17. The information obtained in several of these areas includes: 1) Attitudes toward work in terms of the respondent's current occupation — respondents were asked to indicate the relative importance of, and degree of satisfaction with selected characteristics of occupations. Information provided here may aid in identifying clusters of values which characterize specific occupations or groups of occupations. In addition, we may obtain clues regarding continuity of employment and future turnover among persons in various occupations, and in relation to such factors as age, geographic location, and training background. 2) Marital status and fertility — this includes both the marital status of the respondent as well as the number and ages of the respondent's children as possible factors in job mobility. Also, we are provided with a measure of the reproductive rates of an important segment of the population. 3) professional characteristics — this area covers membership in professional associations and data on publication of articles or books and presentation of papers at professional meetings. Obviously, these two characteristics are only a few of the many which could be explored regarding status or professionalism among the occupations being studied.

18. The second major group covered in the Postcensal Survey encompasses a sample of all college graduates broken into a number of subgroups. The two main subgroups included: 1) those in the labor force in 1960 employed in all other occupations not covered in what might be called our target occupation sample; and 2) those in the labor reserve in 1960 (employed at some time between 1950 and 1960 in occupations covered in our professional and technical occupations sample). For all these respondents, information was also obtained on their work and career histories, training background, and various personal characteristics. Not only will the data provided by the persons in this group result in a comparative analysis of the Nation's college-educated population, but in terms of our own particular interests, we will be able to determine in large measure the extent to which persons trained in scientific and technical fields were, in 1960, working in occupations seemingly unrelated to this training; the same for persons who started their careers in professional, scientific, and technical occupations and were employed elsewhere in 1960; and finally, what potential exists among those in the professional and technical labor reserve in 1960 for possible reemployment in professional, scientific and technical fields.

19. The data and information culled from these studies and added to information from other past, current and future studies will hopefully bring us closer to the day when the formulation of policies affecting our highly trained manpower will be undertaken with much greater assurance and confidence than heretofore.

THE POSTCENSAL STUDY — DATA COLLECTION, PROCESSING AND TABULATING

by

Stanley Greene and David L. Kaplan

*Bureau of the Census**

1. The Postcensal Study of Professional and Technical Manpower represents a major survey undertaking of the Bureau of the Census. There were various tasks involved covering a wide range of technical activities.

2. The major tasks associated with this project presently completed by the Bureau of the Census are as follows:—

(i) Design and printing of questionnaires and other forms.
(ii) A pretest covering 600 cases.
(iii) Sample selection of some 70,000 persons covering 49 specified professional and technical occupations and college-graduate groups from the 1960 Census of Population records.
(iv) Matching of selected sample cases to the 1960 Population Census schedules to obtain name and address for mailing purposes.
(v) Mailing operation consisting of an original mail-out, follow-up as required by two reminder letters and, finally, a reminder letter under the National Science Foundation letter-head.
(vi) Independent subsampling of the two classes of nonresponses:— a) those returned by the post office as nondeliverable, and b) those apparently delivered but not answered. The two groups were subsampled for further follow-up by, respectively, a) addressing new questionnaires to the reported employers in care of their employees (requiring a search and match of the 1960 Census of Population returns for names of employers and a directory search for the corresponding address) and b) having the nonrespondent cases interviewed by Census Bureau enumerators in the areas covered by the Current Population Survey.
(vii) Manual editing and coding of the returned questionnaires.
(viii) Card punching the information (requiring six punch cards per case).

3. As the time of writing the following phases of the project remain to be implemented although much of the planning work has been completed:—

(i) Transfer of punch card data to computer tape.
(ii) Preparation of the computer tape record for each case and weighting of cases.
(iii) Tallying the required tabulations.

4. Details of the various phases of the planning, implementation, and results are discussed in this paper.

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UNIVERSE

5. Several major classes of people comprised the universe included in the survey. The largest class consisted of persons who were reported as being in the experienced civilian labor force in specified professional occupations in the 1960 Census[1]. This included those who were employed in the specified occupations and those who were unemployed, but whose last job was in one of the selected occupations.

6. The original planning called for 33 professional occupations. Three of these were dropped[2] before the survey was taken, whereas librarians were limited to those employed in public libraries, and elementary or secondary schools and compiled as separate groups. Thus there were 31 distinct professional categories in the survey. These are listed on table 1.

7. A second major class included in the survey comprised those persons in the « Experienced civilian labour force » in seven technical occupation groups. The occupations included were designers, draftsmen, surveyors, medical and dental technicians, electrical and electronic technicians, other engineering and physical sciences technicians, and technicians not elsewhere classified.

8. In addition to the two major classes of occupations listed above, the survey included a sample of persons who had completed four or more years of college. This last major class was subdivided into the following seven groups. The first three groups were in the labor reserve[3] in 1962. The three labor reserve groups covered:

i) Females, ages 30 to 54 years, with experience in one of the selected professional or technical occupations.
ii) Other persons with experience in one of the selected professional or technical occupations.
iii) All persons in labor reserve with experience in occupations not selected for the survey.

9. The persons in the « experienced civilian labour force » who were in occupations other than those selected for the survey were subdivided into the following three groups:

i) Managers, officials and proprietors (not elsewhere classified) who were working in the following industries:

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[1] For information on the classification of occupations in the 1960 Census, see U.S. Bureau of the Census, 1960 *Census of Population, Alphabetical Index of Occupations and Industries*, Edition, Washington, D.C., 1960, and its companion volume U.S. Bureau of the Census, 1960 *Census of Population, Classified Index of Occupations and Industries*, Washington, D.C., 1960. For information on the definition of concepts used by the Bureau of the Census, see the text in the following reports: *U.S. Census of Population*: 1960, *Detailed Characteristics, United States Summary*, Final Report PC (1) - 1D, Washington, D.C., 1963, and *U.S. Census of Population*: 1960, *Occupational Characteristics*, Final Report PC (2) - 7A, Washington, D.C., 1963. The second report has been released in October of 1963.

[2] Professional nurses, pharmacists, and physicians and surgeons who were employed by any level of government, but not working in hospitals.

[3] In the 1960 Census the term labour reserve was used for those persons who had worked sometime during the period of 1950 to 1960, but were not in the labour at the time of the census.

Agriculture, forestry and fisheries
Mining
Construction
Manufacturing
Transportation, communications, and other public utilities
Entertainment and recreation services
Professional and related services
Public administration

ii) Balance — Females, ages 20 to 54 years.
iii) All others.

10. The remaining group consists of the remaining noninstitutional population, 20 years old and over not in the Armed Forces.

11. The complete list of 45 classes and the detailed components are outlined in table 1.

DESIGN AND PRINTING OF QUESTIONNAIRES AND OTHER FORMS

12. The original questionnaire was designed by the National Opinion Research Center. This questionnaire was reviewed for feasibility by the Bureau of the Census. These two organizations in consultation with the sponsoring agencies, developed the questionnaire that was used in the Census Bureau pretest.

13. The questionnaire used in the pretest consisted of eight pages divided into four sections. The first section dealt with current employment, asking questions on their present employment status, and, if working, on the respondent's occupation, industry, earnings, job activities, work attitudes, and the holding and nature of a second job.

14. The second section asked questions on the employment status as of April 1, 1960 (the date of the Decennial Census) and the respondent's first full-time job after reaching age 25 (an age where most persons had completed their formal education).

15. Section III inquired about the educational and training level of the respondent. It asked questions on the colleges attended, field of study, type of degree granted and year work was ended. This section also asked about the source of finances for their post-high school training and other types of training they may have received, such as company training programmes, home study correspondence courses, and military training applicable to civilian occupations.

16. The last section requested background information such as age, sex, type of residence when growing up, marital status and number of dependents. An analysis of the results of the pretest questionnaire was the basis for redesigning the questionnaire. Most of the changes were in the format, but some changes were made in the items with several additions being made to the section IV on background information.

17. Three variations of the questionnaire were designed and used in the survey. The basic questionnaire was used for the selected professional occupations, and the three « experienced civilian labour force » classes. A

variation of the basic questionnaire was used for the technicians. The major changes in this questionnaire were in the list of job activities and the technicians were not asked work attitudes. A second variation of the questionnaire was used for the labour reserve and the last class of those not in the labour force nor the labour reserve. The major difference in this questionnaire was in the method of asking for past work experience.

18. A supplementary questionnaire was sent to a portion of the biologists and psychologists on sources of research support they may have received during their graduate studies.

PRETESTS

19. A feasibility pretest of this survey, covering 275 cases, was conducted in the Chicago area by the National Opinion Research Center. Another pretest was conducted by the Bureau of the Census beginning in the fall of 1961. Persons in professional and technical occupations used in this survey were selected from a special evaluation project file which provided the names and addresses of respondents. Approximately 600 cases were selected for the pretest. An original mailing was followed by two reminder mailings sent to the nonrespondents. The response rates of this pretest are given below.

	NUMBER	RESPONSES	
		NUMBER	PERCENT
Total	591	419	70.9
Original mailing	591	259	43.8
First follow-up	332	110	33.1
Second follow-up	222	50	22.5

20. A subsample of the nonresponse cases, amounting to 71 cases, was drawn for further follow-up activity. This work consisted of a personal phone call reminder to the nonrespondent and produced 23 additional returns. Therefore the final number of completed questionnaires received in the pretest was 442 or 74.8 per cent. (A figure quite similar to our results in the main study.)

21. These completed questionnaires were then analyzed and tabulated focusing on the problem of nonresponse by item and inconsistency between items. The result of this analysis was the final determinant in preparing the format and wording of the questionnaires.

SAMPLE SELECTION

22. The Bureau, in consultation with the sponsoring agencies, selected the sample for the survey. First, within the limits of financing and statistical reliability, the number of sample cases required for each occupation and other group in the universe was determined. (See col. 1 of table 2.) Estimates were made — since the universe counts were not yet available at

the time — of the number of cases of each of these groups that would appear on the 1960 Census 25 per cent sample tape file. These two figures provided the basis for determining a differential sampling ratio for each group to supply the required number of sample cases (col. 3). Since the basic universe was not known but had to be estimated, a very liberal sampling ratio was adopted to assure that a sufficient number of sampling cases would be selected from the Census 25 per cent sample file. Using these sampling ratios, the first selection (and count of the total in each category) was made by the computer on a sample «every K case» basis. The computer identified and selected by the predetermined sampled ratio each category of the sample universe (shown in col. 4).

23. Revisions in the groups to be surveyed were also made. For example, pharmacists were deleted from the study and became the basis of a special project.

24. Such revisions in the groups were cause for increasing the number of sample cases required for certain of the remaining groups (col. 2). The revised number of sample cases required for the study was then compared to the first sample selection based upon the liberal sampling fraction. A division of these two figures for each group provided a subsampling fraction (col. 5). The computer then applied the subsampling fraction to the first sample selection and selected the final sample (col. 6). This was accomplished in the following manner. A random start between zero and the final sampling fraction was selected for each category. To this random start the sampling fraction (to five decimal places) was added for each case in the first sample selection. When this sum exceeded or equalled «one» the case thus identified was selected and the sum reduced by one. If the sum for the case did not equal or exceed «one» the case was not selected and the next addition was made.

25. The computer then identified the sample cases and also selected for high-speed printouts, pertinent data for the sample case, providing a basis for searching original Census records for purposes of matching and name and address determination for mailing the questionnaires.

26. A subsample of 1,200 biologists and 1,000 psychologists was selected to receive the supplementary questionnaire on research support. These cases were selected by using a random start and every «n»-th case thereafter. «n» was computed by dividing the number of cases selected to receive the supplementary questionnaire by the total number of cases in the survey with the specified occupational code.

Matching and Mailing Operations

27. When the sample was selected from the 1960 Census tapes, certain identification items were selected for each case and printed out on a listing. Some of the identification items used were the codes for State, county, enumeration district (ED), occupation, industry, age, and highest school grade completed. Each case was also assigned a control number. With this information the Census schedule books were searched to ascertain the name and address of the individual.

28. At the same time the names and addresses were being located, punch cards were being prepared for control purposes. These cards noted

the control number, State, and a code indicating the type of questionnaire required. The name and address, as ascertained from the match of Census records, was also typed on the card. This typed address was reproduced by a Xerox process and used for the address labels. The card itself was used for check-in control (those not showing a notation of receipt of schedule being sent additional mailings as required).

29. Although there were 45 independent samples comprising the survey, they broke down into three major components for purposes of schedule design and into four separate groups for purposes of the mailing operation.

30. The mailing operation consisted of an original mailing and three follow-up mailings. Each mailing — the original and follow-up — was colour coded by varying the colour of the schedule. This was done primarily for control of the mailout sequence. The mailouts were divided into four groups as determined by the respondents' status in the 1960 Census. The first group represented selected professional workers in the labour force (excluding 5,200 biological scientists and psychologists).

31. All biological scientists and psychologists were sorted from the professional group described above. A sample of about 1,200 biological scientists and 1,000 psychologists was then merged into one group. The portion of the biological scientists and psychologists not selected in the sample was returned to their original file.

32. Another group consists of those persons with technical occupations. The last group is composed of the labour reserve.

33. The mailing pieces to each of these groups consisted of

1. the respective questionnaire (the biological scientists and psychologists also received a supplementary questionnaire),
2. an introductory letter,
3. a « Fields of Specialization List, »
4. a return envelope.

Receipts

34. The endeavours described in the mailing operation elicited 51,500 completed questionnaires from the original panel of 71,500. The rate of receipt amounted to 72.5 per cent. This figure compares favourably with our pretest experience where the return rate amounted to 70.9 per cent.

35. Variations in the categories may be noted in table 1. (This table shows rates of receipt by each of the 45 classes.) For the professional group, the highest receipt rate was achieved, amounting to 75.6 per cent, whereas the technical worker group — somewhat under the average return rate — amounted to 63.9 per cent. Among the professional workers, it may be noted that the highest return rate is 85 per cent (foresters and conservationists).

Field Follow-up Procedures

36. About 12,500 of the original cases did not respond to any of the four original mailings and constituted the « nonanswer » file of nonrespondents. This group was sampled at approximately a 1 in 4 rate for

personal follow-up. Thus about 1,000 cases required follow-up, all of which, by design, fell into Primary Sampling Units of the Bureau's Current Population Survey and thus an existing field staff was available to implement the procedure. The procedure called for all sample cases to be selected in the Bureau's central office and identified by their PSU number and other relevant information (name, address, phone number, appropriate schedule). This information was packaged along with required forms and instructions and sent to the Bureau's Regional Offices. The Regional Offices in turn transmitted the materials to the proper interviewers. The interviewers contacted each nonrespondent by telephone, asking them to complete a questionnaire. Those cases indicating cooperation were mailed one by the interviewer, along with a Regional Office return envelope. Those cases indicating a refusal to complete a questionnaire were asked eight basic questions on the phone.

37. When the interviewer completed this phase of the work, she sent a record of the results of her assignment to the Regional Office. The Regional Office matched the completed questionnaires received to the record of results. The unmatched forms for those who were mailed questionnaires were returned to the interviewers, who again called the person and proceeded to ask the basic questions.

38. In regard to the «postal reject» file (that group never delivered by the post office), amounting to 7,100 cases, a sample of 1,000 random cases was drawn. A further attempt to locate these cases was made through their last known employer. Since the 1960 Census results provided the name of the employer, we had a basis for operation.

39. The steps required to implement this follow-up required a matching and searching of the original census record. After the case was located, the company name entered on the schedule was transcribed to a special listing. The address of the establishment was then obtained by checking through city directories and other reference material. The questionnaires were then mailed to the respondent in care of the employer using the normal mailing procedures with provision made for the follow-up mailings. These activities resulted in a return rate of about 30 per cent.

Coding and Editing of Schedules

40. The processing work was accomplished by dividing the work into two major portions, namely «General Coding» and «Occupation and Industry Coding.» The schedules were designed to minimize coding by associating the entry boxes where possible with predetermined punching codes. Where this was not possible, as in the cases of «institution attended,» «type of degree granted,» «name of sponsoring institution,» «subject of training,» and «State and county of residence,» codes had to be predetermined and, as in the case of «subject of training,» a three-digit code was formulated and a special publication prepared noting the subject field content of each broad three-digit field. Also, during the «General Coding» phase, extensive editing rules were applied to the items to account for some blanks, obvious inconsistencies, consideration of fractions, improper placement of entries, dual entries, finding midpoints of ranges (if given), conversion of income entries to codable form, conversion of improper time

basis to acceptable basis. Further editing of this nature will also be implemented in the computer.

61. The « Occupation and Industry Coding » phase of the work was done in accordance with the 1960 Census of Population classification scheme, with some minor modifications. All clerical work was verified completely on a dependent basis.

Preparing the Record and Weighting

62. Prior to tallying the tabulations in the Postcensal Study, certain programming activities are required to prepare the computer tape record.

63. Each questionnaire required six 80-column punch cards to accommodate the data. This information must first be transferred from punch cards to computer tape and the six cards for each case must be consolidated into a single record for a person (eliminating the duplication of identification items required on each punch card).

64. Each of the 45 occupations receives a differential weight. The methodology involved in this weighting calls for a consideration of the three following classes of responses:

1. Initial responses
2. Responses from a field follow-up programme
3. Responses from a file for « postal rejects »

65. The latter two classes have to be weighted to the totals from which they are drawn[1]. The determination of these weights will be done clerically and incorporated in the punch card. After these intermediate weights are on the record and are applied to the latter two classes, this file will be merged with the initial responses (class 1). The final weights to be applied to each occupation group would be the proportions these merged totals bear to their respective grand total as determined by the 1960 Census results.

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[1] The methodology outlined herein is subject to review of the reliability of the follow-up data by Bureau sampling experts.

TABLE 1. DETAILED COMPONENTS OF THE UNIVERSE AND RESULTS OF THE POSTCENSAL STUDY OF PROFESSIONAL AND TECHNICAL MANPOWER

OCCUPATIONS AND OTHER GROUP SAMPLED	UNIVERSE OF CASES IN SURVEY	CASES RETURNED	
		NUMBER	PER CENT
I. Occupations in the survey and their Census codes	[illegible]	[illegible]	[illegible]
A. Selected professional occupations	[illegible]	[illegible]	[illegible]
[illegible] Chemists	[illegible]	[illegible]	[illegible]
College presidents, deans, and professors and instructors, nonscientific subjects	[illegible]	[illegible]	[illegible]
[illegible] College presidents and deans			
[illegible] Professors and instructors, nonscientific subjects			
Professors and instructors, natural science	[illegible]	[illegible]	[illegible]
[illegible] Professors and instructors, agricultural sciences			
[illegible] Professors and instructors, biological sciences			
[illegible] Professors and instructors, chemistry			
[illegible] Professors and instructors, geology and geophysics			
[illegible] Professors and instructors, mathematics			
[illegible] Professors and instructors, medical sciences			
[illegible] Professors and instructors, physics			
[illegible] Professors and instructors, natural sciences, not elsewhere classified			
Professors and instructors, social science	[illegible]	[illegible]	[illegible]
[illegible] Professors and instructors, economics			
[illegible] Professors and instructors, psychology			
[illegible] Professors and instructors, statistics			
[illegible] Professors and instructors, social sciences, not elsewhere classified			
[illegible] Professors and instructors, engineering	[illegible]	[illegible]	[illegible]
[illegible] Professors and instructors, subject not specified	[illegible]	[illegible]	[illegible]
[illegible] Engineers, aeronautical	[illegible]	[illegible]	[illegible]
[illegible] Engineers, chemical	[illegible]	[illegible]	[illegible]
[illegible] Engineers, civil	[illegible]	[illegible]	[illegible]
[illegible] Engineers, electrical	[illegible]	[illegible]	[illegible]
[illegible] Engineers, industrial	[illegible]	[illegible]	[illegible]
[illegible] Engineers, mechanical	[illegible]	[illegible]	[illegible]
[illegible] Engineers, metallurgical and metallurgists	[illegible]	[illegible]	[illegible]
[illegible] Engineers, mining	[illegible]	[illegible]	[illegible]
[illegible] Engineers, sales	[illegible]	[illegible]	[illegible]
[illegible] Engineers, not elsewhere classified	[illegible]	[illegible]	[illegible]
[illegible] Foresters and conservationists with 4 or more years of college	[illegible]	[illegible]	[illegible]
[illegible] Librarians – elementary and secondary schools } with 4 or more years of college [illegible] Librarians – public libraries	[illegible]	[illegible]	[illegible]

TABLE 1 (Cont'd). DETAILED COMPONENTS OF THE UNIVERSE AND SAMPLE IN THE POSTCENSAL STUDY OF PROFESSIONAL AND TECHNICAL MANPOWER

OCCUPATION AND OTHER GROUP NAMES	NUMBER OF CASES IN SAMPLE	CASES RETURNED	
		NUMBER	PER CENT
[illegible] Agricultural scientists	[illegible]	[illegible]	[illegible]
[illegible] Biological scientists	[illegible]	[illegible]	[illegible]
[illegible] Geologists and geophysicists	[illegible]	[illegible]	[illegible]
[illegible] Mathematicians	[illegible]	[illegible]	[illegible]
[illegible] Physicists	[illegible]	[illegible]	[illegible]
[illegible] Miscellaneous natural scientists	[illegible]	[illegible]	[illegible]
[illegible] Economists	[illegible]	[illegible]	[illegible]
[illegible] Psychologists	[illegible]	[illegible]	[illegible]
[illegible] Statisticians and actuaries	[illegible]	[illegible]	[illegible]
[illegible] Miscellaneous social scientists	[illegible]	[illegible]	[illegible]
[illegible] Teachers, elementary schools (Public schools only)	[illegible]	[illegible]	[illegible]
[illegible] Teachers, secondary schools	[illegible]	[illegible]	[illegible]
B. Selected technical occupations	[illegible]	[illegible]	[illegible]
[illegible] Designers	[illegible]	[illegible]	[illegible]
[illegible] Draftsmen	[illegible]	[illegible]	[illegible]
[illegible] Surveyors	[illegible]	[illegible]	[illegible]
[illegible] Technicians, medical and dental	[illegible]	[illegible]	[illegible]
[illegible] Technicians, electrical and electronic	[illegible]	[illegible]	[illegible]
[illegible] Technicians, other engineering and physical sciences	[illegible]	[illegible]	[illegible]
[illegible] Technicians, not elsewhere classified	[illegible]	[illegible]	[illegible]
III. Persons with an educational attainment of four or more years of college			
A. In experienced civilian labor force and not in the selected professional or technical occupations	[illegible]	[illegible]	[illegible]
1. Managers, officials, and proprietors (not elsewhere classified) who were working in the following industries	[illegible]		
Agriculture, forestry, and fisheries			
Mining			
Construction		[illegible]	[illegible]
Manufacturing			
Transportation, communications, and other public utilities			
Professional and related services			
Public administration			

1. Persons, ages 20 to 49 years, with experience in one of the selected professional or technical occupations	[illegible]	[illegible]	[illegible]
2. Other persons with experience in one of the selected professional or technical occupations	[illegible]		
3. All persons in the labour reserve with experience in occupations not selected for the survey	[illegible]	[illegible]	[illegible]
C. Persons 20 years old or older not in the labour force, labour reserve not institutions	[illegible]	[illegible]	[illegible]

1. [illegible]

TABLE 2. SAMPLE SELECTION FOR THE POSTCENSAL STUDY OF PROFESSIONAL AND TECHNICAL MANPOWER

OCCUPATION OR CLASSIFICATION	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	(1)	(2)	(3)	(4)	(5)	(6)
Total in survey	[illegible]	[illegible]	...	[illegible]	...	[illegible]
Total professional occupations	[illegible]	[illegible]	...	[illegible]	...	[illegible]
Total college presidents, deans and professors	[illegible]	[illegible]	...	[illegible]	...	[illegible]
College presidents, deans, and professors and instructors, nonscientific subjects	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Professors and instructors, natural science	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Professors and instructors, social science	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Professors and instructors, engineering	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Professors and instructors, subject not specified	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Total engineers	[illegible]	[illegible]	...	[illegible]	...	[illegible]
Engineers, aeronautical	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Engineers, chemical	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Engineers, civil	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Engineers, electrical	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Engineers, industrial	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Engineers, mechanical	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Engineers, metallurgical and metallurgists	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Engineers, mining	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Engineers, sales	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Engineers, not elsewhere classified	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Foresters and conservationists (4 years of college)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Librarians	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Total natural scientists	[illegible]	[illegible]	...	[illegible]	...	[illegible]

Mathematicians	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Physicists	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Miscellaneous natural scientists	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Total social scientists	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Economists	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Psychologists	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Statisticians and actuaries	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Miscellaneous social scientists	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Teachers, elementary public schools	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Teachers, secondary schools	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Total technicians	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Designers	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Draftsmen	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Surveyors	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Technicians, medical and dental	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Technicians, electrical and electronic	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Technicians, other engineering and physical sciences	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Technicians, not elsewhere classified	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Persons in « Other » groups with 4 years of college	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Experienced civilian labour force not in target occupations	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Selected managers	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Balance females ages 20 to 59	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
All others	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Labour reserve	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Females ages 20 to 59 in target occupations	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
All others in target occupations	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Not in target occupations	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Persons 20 years old or over not in the labour force, labour reserve nor institutions	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[illegible]

[illegible]

POSTCENSAL STUDY OF PROFESSIONAL AND TECHNICAL MANPOWER

Section I - CURRENT EMPLOYMENT

[illegible]

1. YOUR WORK STATUS

[illegible]

Month

Year

[illegible]

[illegible]

Dollars

[illegible]

Code

[illegible]

[illegible]

No. of years

[illegible]

(Section I continued)

6. How many weeks did you work in 1961 at all jobs either full-time or part-time?
(Count paid vacation, paid sick leave, and military service as weeks worked.) (Check one)

1 ☐ 13 weeks or less
2 ☐ 14 to 26
3 ☐ 27 to 39
4 ☐ 40 to 47
5 ☐ 48 to 49
6 ☐ 50 to 52

OR 0 ☐ Did not work in 1961

7. YOUR EARNINGS IN 1961:

a. How much did you earn in 1961 in salary and commissions from your major position (before taxes and other deductions)? If you did not work the entire year at this job, give what would have been your yearly salary.

OR--IF YOU ARE SELF-EMPLOYED:

How much did you earn in 1961 in profits or fees from working in your own business, professional practice or partnership (net income after business expenses)?

$ .00

(Estimate to the nearest hundred dollars) (Omit cents)

OR 0 ☐ None

b. In addition to your major position, did you receive any earnings in 1961 from any of the following sources?
(Check as many as apply)

1 ☐ Consulting
2 ☐ Publications
3 ☐ Lectures
4 ☐ Other professional activities
5 ☐ Other secondary job

Estimate to the nearest hundred dollars the amount you received from all of these sources in 1961 (before taxes and other deductions but after deducting any business expenses.)

$ .00

(Omit cents)

OR 0 ☐ None

B. YOUR ACTIVITIES

8. Here is a list of activities which may be part of your work in your major current position.
(Please check all activities which you perform in this position.)

Code No.
01 ☐ Teach courses
02 ☐ Recruit, train people in the organization
03 ☐ Engage in basic research
04 ☐ Engage in applied research, or product development
05 ☐ Administering or supervising research or development
06 ☐ Consult or advise clients or customers on technical matters
07 ☐ Make drawings, blueprints, models
08 ☐ Make forecasts, estimate markets
09 ☐ Exploration; or field work
10 ☐ Design or modify equipment, machinery, processes of production
11 ☐ Supervise the work of assistants or subordinates
12 ☐ Quality control; set precision standards
13 ☐ Public relations, publicity work, speeches
14 ☐ Budgeting, costing, controlling, allocating expenditures
15 ☐ Test new or experimental equipment

Code No.
16 ☐ Travel
17 ☐ Constructing equipment, apparatus, prosthetic devices
18 ☐ Treating patients
19 ☐ Counselling clients, students
20 ☐ Supervising production or construction
21 ☐ Writing technical and general reports on projects
22 ☐ Coordinating activities of professionals at any level in the organization
23 ☐ Keep records
24 ☐ Statistical analysis
25 ☐ Technical sales
26 ☐ Negotiating contracts or raising funds
27 ☐ Briefing superiors on my work
28 ☐ Plan future operations
29 ☐ Compile and annotate bibliography; search and select literature
30 ☐ Other. What? ____________________

____

9. Of all those you checked above, which TWO do you spend the most time doing?
(Fill in their code numbers and write in the approximate percent of total time spent in each of these activities.)

Activity	Code number	Percent of time
FIRST		%
SECOND		%

(Section I continued)

C. PEOPLE YOU WORK WITH

10. About how many people work in the smallest organizational unit to which you belong in the business, industry, or organization in which you work?
Elementary and secondary teachers: check the number of teachers in your school. *(Check one)*

1 ☐ Less than 10
2 ☐ 10 to 24
3 ☐ 25 to 49
4 ☐ 50 to 99
5 ☐ 100 to 249
6 ☐ 250 to 499
7 ☐ 500 or more

11. How many employees are DIRECTLY responsible to you? *(Include both professional and nonprofessional.)*

Number of people ____

OR 0 ☐ None

12. Are you - - *(Check one)*

1 ☐ An administrator (concerned mainly with policy making, planning, overall supervision)
2 ☐ A supervisor (concerned mainly with technical matters)
3 ☐ A coordinator (concerned mainly with liaison)
4 ☐ Other. What? ____________________

13a. Do you - - *(Check as many as apply)*

Code No.
1 ☐ Work with other specialists in your field
2 ☐ Work individually, with little or no consultation with others
3 ☐ Work as an individual consultant to others

Code No.
4 ☐ Work as a member of a team made up of specialists from your field and other fields
5 ☐ Work as a member of a team made up of specialists in other fields
6 ☐ Other. What? ____________________

b. Of all those you checked above, which ONE do you spend the most time doing? *(Write in the box the code number from 13a)*

Code ____

14. This question is about your immediate supervisor. If you have no immediate supervisor, check here ☐ 0 and skip to Question 15.

DO NOT WRITE HERE

a. What kind of work does he do? (For example: civil engineer, nuclear physicist, professor of economics, junior high school principal.)

b. In what field of specialization does he work? *(Fill in the code number from the enclosed list.)*

Code ____

D. ATTITUDES TOWARD WORK

15. Listed below are some characteristics which occupations may have.

a. Please indicate by checking the appropriate box how important each one is to you.

b. Also check the appropriate box to indicate how well your current major employment satisfies you with respect to each characteristic.

Occupational Characteristics		a. Importance to you			b. Degree of satisfaction		
		Very (1)	Somewhat (2)	Little or none (3)	Very (4)	Somewhat (5)	Little or none (6)
Opportunity to be original and creative	1						
Opportunity to be helpful to others or useful to society	2						
Relative independence in doing my work	3						
A chance to exercise leadership	4						
A nice community or area in which to live	5						
Opportunity to work with things	6						
Social standing and prestige in my community	7						
A chance to earn enough money to live comfortably	8						
Pleasant people to work with	9						
Freedom from pressures to conform in my personal life	10						
Opportunity to work with people	11						
Freedom to select areas of research	12						
Opportunity to work with ideas	13						

(Section I continued)

E. CURRENT ADDITIONAL JOB OR BUSINESS

(Defined as a job not with your primary employer)

16. Did you have a second regular job or business last week? *(Exclude any work with your major current employer.)*

1 ☐ Yes   2 ☐ No *(Skip to Section II)*

DO NOT WRITE HERE

17. In your second regular job or business:

a. What kind of business or industry were you working in?
(For example: city hospital, state university, road construction firm, retail drug store.)

b. Were you working - - (Check one)

1 ☐ **For a PRIVATE employer for wages, salary, commission or tips?**
2 ☐ **For GOVERNMENT?** (Federal, State, local, public school system, etc.)
3 ☐ **In OWN business or profession or farm for profit or fees?**
4 ☐ **WITHOUT PAY on family farm or business?**

c. What kind of work were you doing?
(For example: medical technician, research assistant in chemistry, civil engineer, sales clerk.)

d. In what field of specialization did you work? *(Fill in the code number which best describes your field from the enclosed list.)*   Code

18a. Does your additional job involve - - (Check one)

1 ☐ Year-round employment   2 ☐ Seasonal employment only

b. How many hours a week do you usually work in this job or business?   Hours per week

Section II - PAST EMPLOYMENT

In this section we are interested in your past work history, especially your work situation in April 1960 (when the Decennial Census was taken) and your first full-time job after reaching age 25.

A. APRIL 1960

1. What were you doing in April 1960? *(Check one)*

1 ☐ Working (include part-time work)
2 ☐ With a job but not at work (on vacation, sick leave, etc.)
7
3 ☐ Looking for work *(Skip to Question 7 on Page 8)*
4 ☐ Not in labor force, e.g., retired, keeping house, student, etc. *(Skip to Question 7 on Page 8)*

DO NOT WRITE HERE

2. Were you working for the same company, business, or organization in April 1960 as you were in your major employment last week (including self employment)?

1 ☐ Yes *(Skip to Question 3)*   2 ☐ No *(Please answer Questions a to d)*

a. For whom did you work in April 1960? *(Name of company, business, organization or other employer)*

b. What kind of business or industry were you working in?
(For example: city hospital, state university, road construction firm, county junior high school.)   Kind of business

c. Were you working - - (Check one)

1 ☐ **For a PRIVATE employer for wages, salary, commission or tips?**
2 ☐ **For GOVERNMENT?** (Federal, State, local, public school system, etc.)
3 ☐ **In OWN business or profession or farm for profit or fees?**
4 ☐ **WITHOUT PAY on family farm or business?**

d. How many years did you work in this company, business or organization?   No. of years

3. In April 1960, were you doing the same kind of work as you described for last week on Page 1, Item 3a?

1 ☐ Yes *(Skip to next question)*
2 ☐ No (Please describe what kind of work you were doing. For example: civil engineer, nuclear physicist, professor of economics, 9th grade social studies teacher.) →

(Section II continued)

4a. In April 1960, were you working in the same field of specialization as you were last week?

1 ☐ Yes *(Skip to Question 5)* 2 ☐ No *(Go to 4b)*

DO NOT WRITE HERE

b. What field of specialization was this? *(Fill in the code number which best describes your field from the enclosed list.)* Code

5. In April 1960, which two activities did you spend the most time doing? *(Consult the list on Page 2, Item 8, and fill in the code numbers.)* First activity Second activity

6. Your immediate supervisor in April 1960-- If you have no immediate supervisor check here ☐0 and skip to Question 7.

What kind of work did he do? (For example: civil engineer, nuclear physicist, professor of economics, junior high school principal.) Kind of work

B. PLEASE THINK BACK TO THE FULL-TIME CIVILIAN JOB HELD UPON REACHING AGE 24 OR IF NOT WORKING THEN, THE FIRST ONE HELD THEREAFTER.

0 ☐ Check here and skip to Question 11 if you are now under age 24.

7. Was your first full-time civilian job after reaching age 24--

a. The same as in April 1960? .... 1 ☐ Yes 2 ☐ No

b. The same as your job last week? .... 1 ☐ Yes 2 ☐ No

(If you answered "No" in BOTH "a" and "b", please complete this section. Otherwise skip to Question 11.)

DO NOT WRITE HERE

8. In what year did you enter this job (the job held upon reaching age 24 or the first one held thereafter)? Year

9a. What kind of business, industry, or organization were you working in? (For example: city hospital, state university, road construction firm, county junior high school.) Kind of business

b. Were you working at that time - - *(Check one)*

1 ☐ For a PRIVATE employer for wages, salary, commission or tips?

2 ☐ For GOVERNMENT? (Federal, State, local, public school system, etc.)

3 ☐ In OWN business or profession or farm for profit or fees?

4 ☐ WITHOUT PAY on family farm or business?

c. What kind of work were you doing? (For example: civil engineer, nuclear physicist, professor of economics, 9th grade social studies teacher.) Kind of work

d. In what field of specialization was this? *(Fill in the code number which best describes your field from the enclosed list.)* Code

e. Describe what you did in your full-time job at that time:

____

____

10. How many years did you work in this company, business, or organization? No. of years

C. GENERAL EMPLOYMENT

11. How many years have you ever worked either full-time or part-time in your present field of specialization? No. of years

12. How many different employers have you ever had in your present field of specialization? No. of employers

13. Are there any other fields of specialization in which you worked for at least one year besides those you have already listed?

(Fill in their code numbers from the enclosed list.)

Field	Code
FIRST	
SECOND	

14. Did you ever work full-time for at least six months in any of the following? *(Check as many as apply)*

01 ☐ Federal Government (includes all civilian employees of Federal Government agencies; also Federal hospitals. Does not include military service.)

02 ☐ State or local government (includes state or municipal hospitals, but excludes public schools or universities)

03 ☐ Public college or university

04 ☐ Private college or university

05 ☐ Public elementary or secondary school

06 ☐ Private elementary or secondary school

07 ☐ Research organization or institute (except government or university)

08 ☐ Hospital, clinic, welfare organization (except government)

09 ☐ Professional partnership

10 ☐ Other private business or industry

11 ☐ Independent consulting work

12 ☐ Other self-employment

13 ☐ Foreign government or international agency

14 ☐ Career in Armed Forces

15 ☐ Other (not mentioned) *(Specify)*

____

FORM 6

Section III - YOUR TRAINING

1. How many years of education and formal training have you had? *(Check the highest year completed)*

Never attended school .... 0 ☐

Elementary and high school .... 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 ☐ 11 ☐ 12 ☐

All schools attended beyond the high school level, including college, technical institute, etc. (academic years)........... 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 or more ☐

2. Which of the following types of elementary and high schools did you attend? *(Check as many as apply)*

1 ☐ Public 2 ☐ Parochial 3 ☐ Other private

3. While you attended high school, did you receive any G.I. Bill or Vocational Rehabilitation financial aid from the U.S. Veterans Administration?

1 ☐ Yes 2 ☐ No 3 ☐ Never attended high school *(Skip to 6)*

4. During your senior year in high school, was your curriculum - - *(Check one)*

1 ☐ Academic
2 ☐ General
3 ☐ Technical
4 ☐ Vocational
5 ☐ Commercial
6 ☐ Other *(Specify)* ____________
7 ☐ Did not attend through senior year *(Skip to 6)*

5. How large was your high school graduating class? *(Check one)*

1 ☐ Less than 50
2 ☐ 50 to 99
3 ☐ 100 to 199
4 ☐ 200 to 299
5 ☐ 300 to 399
6 ☐ 400 to 499
7 ☐ 500 or more
8 ☐ Did not graduate

6. List below in order of attendance, each institution from which you obtained or are currently obtaining formal training beyond the high school level, and give the other information as requested.

NOTE: If training was taken abroad, enter the name of the foreign country under "Location".

Use a separate line for each degree granted, worked for, or for any change in major field of specialized study. Refer to the enclosed list for the code numbers of fields of specialized study.

Institution		Major field of study *(Code)*	Year work ended	Type of degree granted (if any)	No. of months of study completed		
					Total number of months	With G.I. Bill or Voc. Rehab. aid from VA	
Name	Location *(State)*					Yes *(No. of months)*	No *(Check)*
1.			19___				
2.			19___				
3.			19___				
4.			19___				

7. How did you finance this post-high school training? *(Check as many as apply)*

Source		Under-graduate (1)	Graduate or professional (2)
A scholarship or fellowship* from:			
College or university	01	☐	☐
Federal agency:			
National Science Foundation	02	☐	☐
Public Health Service - National Institutes of Health	03	☐	☐
Office of Education	04	☐	☐
Other *(Specify)* ____________	05	☐	☐
A research or teaching assistantship	06	☐	☐
Loans	07	☐	☐
Own earnings from employment while attending school (except assistantship)	08	☐	☐
Own savings from previous employment (including that earned between school terms)	09	☐	☐
Employer paid for the training	10	☐	☐
Aid from my parents, relatives, spouse, or spouse's parents	11	☐	☐
Veterans Administration Benefits: G.I. Bill or Vocational Rehabilitation	12	☐	☐
Other sources	13	☐	☐
(WRITE IN THE BLANKS THE CODE NUMBER OF THE SINGLE MOST IMPORTANT SOURCE.)		____	____

---

* Defined as a financial grant for which no services are required; does not include loans which require repayment.

[illegible] [illegible]

(Section III continued)

8. Which of the following items listed below contributed most significantly to your becoming qualified for your present job? *(Check as many as apply)*

V ☐ Check here if you are not currently employed

1 ☐ Experience in present or related field of employment

2 ☐ Course work at a college or university without a degree

3 ☐ Acquired a B.A., B.Sc., etc.

4 ☐ Acquired a graduate or professional degree

5 ☐ Course work at a technical institute

6 ☐ Course work at Junior or Community College

7 ☐ Post-high school courses at a vocational or technical high school

8 ☐ Correspondence courses

9 ☐ Special training or course given by employer

0 ☐ Other *(Please specify)* ____________

9. Do the qualifications for your present job require a license or a certificate?

1 ☐ Yes   2 ☐ No *(Skip to Question 11)*

10a. Do you presently have such a license or certificate?

1 ☐ Yes   2 ☐ No *(Skip to question 11)*

b. Is this a standard license or certificate representing full qualifications?

1 ☐ Yes   2 ☐ No

11. Have you ever received or are you currently receiving any of the following types of training?

1 ☐ Yes

2 ☐ No *(Skip to Question 12)*

Code No.	
01	Apprenticeships
02	Company training programs (other than apprenticeships)
03	Military training applicable to civilian occupations
04	On-the-job training
05	High school extension courses
06	Home study correspondence courses
07	Agricultural training courses
08	United States Armed Forces Institute courses
09	Work-Study Programs
10	Workshops, Seminars, etc.

(If "Yes," give the name of the organization or institution providing this training received and enter the other information as requested. Do not repeat the training listed in Question 6, Page 6.)

Name of sponsoring institution or organization	Type of training (Code No. from above list)	Subject of training	Weeks of training	Year ended	Did you complete the course?		With G.I. Bill or Voc. Rehab. aid from VA	
					Yes	No	Yes	No
				19___				
				19___				
				19___				
				19___				
				19___				
				19___				

12. This question is for United States Veterans of World War II or the Korean Conflict.

☐ Not a veteran of either *(Check here and go to Section IV)*

a. Did you receive any formal vocational counseling, including aptitude testing, from . . . *(Check one)*

1 ☐ Veterans Administration or VA Guidance Center

2 ☐ A source other than VA

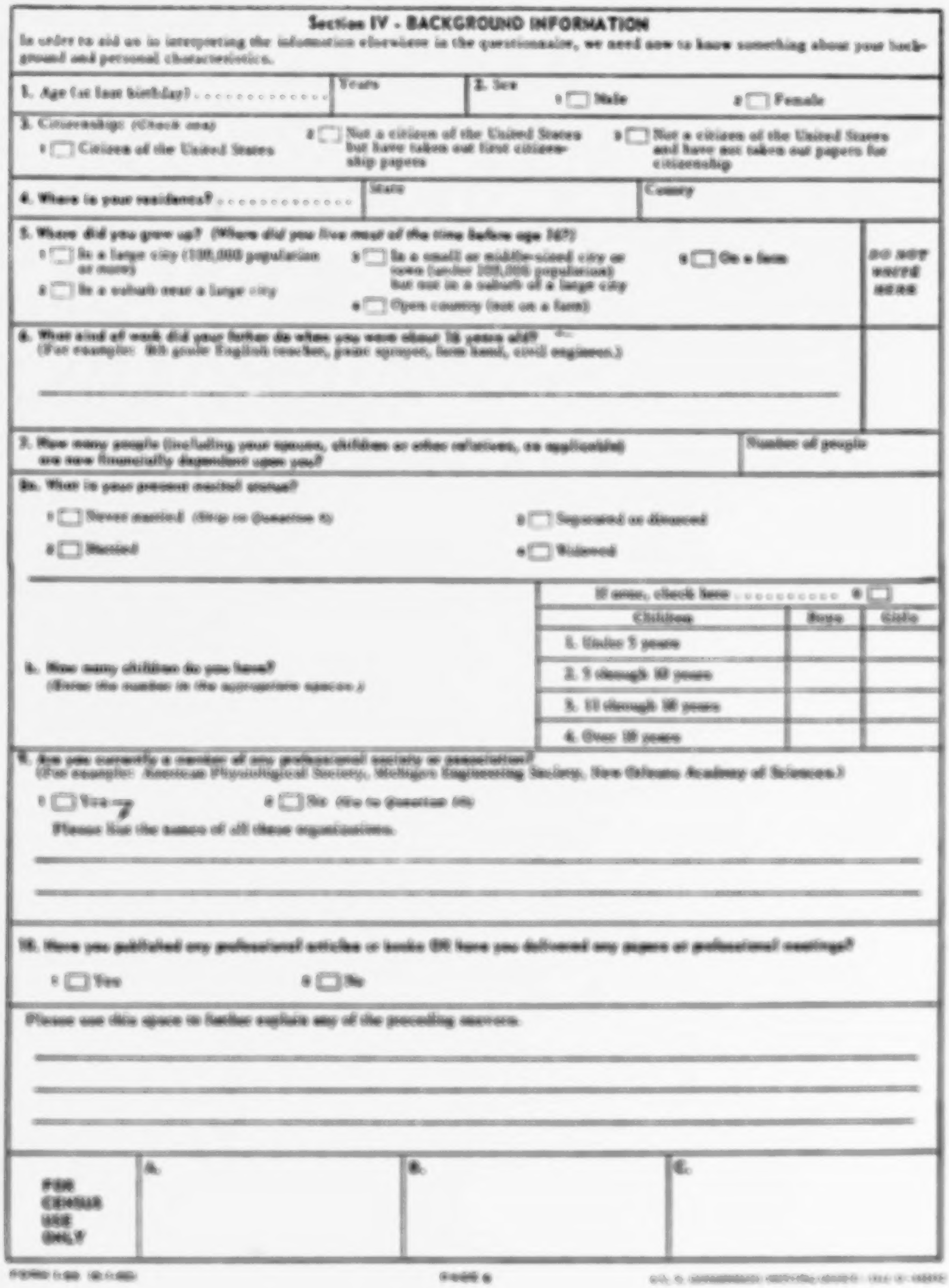
3 ☐ Both VA and other source

(Please answer 12b)

4 ☐ Never had any such vocational counseling *(Please skip to Section IV)*

b. Was this counseling significantly useful to your career?

1 ☐ Yes   2 ☐ No



Section IV - BACKGROUND INFORMATION

In order to aid us in interpreting the information elsewhere in the questionnaire, we need now to know something about your background and personal characteristics.

1. Age (at last birthday)	Years	2. Sex 1 ☐ Male 2 ☐ Female

3. Citizenship: *(Check one)*
1 ☐ Citizen of the United States
2 ☐ Not a citizen of the United States but have taken out first citizenship papers
3 ☐ Not a citizen of the United States and have not taken out papers for citizenship

4. Where is your residence?	State	County

5. Where did you grow up? *(Where did you live most of the time before age 16?)*
1 ☐ In a large city (100,000 population or more)
2 ☐ In a suburb near a large city
3 ☐ In a small or middle-sized city or town (under 100,000 population) but not in a suburb of a large city
4 ☐ Open country (not on a farm)
5 ☐ On a farm

DO NOT WRITE HERE

6. What kind of work did your father do when you were about 16 years old?
(For example: 8th grade English teacher, paint sprayer, farm hand, civil engineer.)

7. How many people (including your spouse, children or other relatives, as applicable) are now financially dependent upon you?	Number of people

8a. What is your present marital status?
1 ☐ Never married *(Skip to Question 9)*
2 ☐ Married
3 ☐ Separated or divorced
4 ☐ Widowed

b. How many children do you have?
(Enter the number in the appropriate spaces.)

If none, check here . . . . 0 ☐

Children	Boys	Girls
1. Under 5 years		
2. 5 through 10 years		
3. 11 through 18 years		
4. Over 18 years		

9. Are you currently a member of any professional society or association?
(For example: American Physiological Society, Michigan Engineering Society, New Orleans Academy of Sciences.)
1 ☐ Yes 2 ☐ No *(Go to Question 10)*
Please list the names of all these organizations.

10. Have you published any professional articles or books OR have you delivered any papers at professional meetings?
1 ☐ Yes 2 ☐ No

Please use this space to further explain any of the preceding answers.

FOR CENSUS USE ONLY	A.	B.	C.

FORM [illegible] PAGE 8 [illegible]

Annex VIII

AN OCCUPATIONAL CLASSIFICATION SCHEME FOR CROSS TABULATIONS WITH EDUCATIONAL DATA

The following classification scheme of occupations was first presented in « Forecasting Educational Needs for Economic and Social Development » by Herbert Parnes, OECD, Paris 1962. A breakdown of the occupations into the four educational categories « A, » « B, » « C » and « D » as in this book is not, however, recommended, since each of the 33 occupational groups is to be cross classified with the actual educational qualifications of the people in these occupations. The occupational classification system groups all the occupations listed in the International Standard Classification of Occupations (Geneva : International Labour Office, 1958), are those of the ISCO. All code numbers which should be referred to for the detailed content of each occupational category, and the definitions of the occupations.

Occupations

1. Architects (unit group 0-01).
2. Engineers (unit group 0-02).
3. Physical scientists and mathematicians (minor group 0-1 ; occupation 0-Y9.35).
4. Biologists, veterinarians, agronomists and related scientists (minor group 0-2).
5. Professional medical personnel.
    - *a*) Physicians and surgeons (unit group 0-31).
    - *b*) Dentists (unit group 0-32).
    - *c*) Other professional medical workers (unit group 0-51, 0-52, 0-59).
6. University teachers, sciences (occupation 0-61.30).
7. Secondary school teachers, sciences (occupation 0-69.40)[1].
8. Administrative, executive, and managerial workers (major group 1).
    - *a*) Administrative and executive officials, government (minor group 1-0)

---

[1] The ISCO does not differentiate between teachers of science and other teachers at the secondary level. For purposes of the present classification system, therefore, ISCO occupation 0-69.40 must be divided into two sub-groups.

    b) Directors, managers, and working proprietors (minor group 1-1)[1].

9. University teachers, except sciences (occupations 0-61.20, 0-61.90).
10. Secondary school teachers, except sciences (occupation 0-69.40)[2].
11. Teachers not elsewhere classified (not including elementary and nursery school teachers) (occupation 0-69.90).
12. Economists, professional accountants, actuaries and statisticians (unit groups 0-Y1, 0-Y4).
13. Social scientists other than economists (minor group 0-8; unit group 0-Y2, occupations 0-Y9.20, 0-Y9.23, 0-Y9.26, 0-Y9.29, 0-Y9.32, 0-Y9.38, 0-Y9.41, 0-Y9.44, 0-Y9.47).
14. Artists, writers, and related creative artists (minor group 0-9).
15. Scientific and Technical workers not elsewhere classified (minor group 0-7; unit group 0-Y3; occupations 0-Y9.50, 0-Y9.59, 0-Y9.90).
16. Science and engineering technicians and draughtsmen (minor group 0-X).
    - *a*) Technicians, engineering (occupation 0-X9.20).
    - *b*) Technicians, research laboratory (occupation O-X9.30).
    - *c*) Technicians, industrial laboratory (occupation 0-X9.40).
    - *d*) Science and engineering technicians not elsewhere classified and laboratory assistants (occupation 0-X9.90).
    - *e*) Draughtsmen (unit group 0-X1).
17. Surveyors (unit group 0-03).
18. Medical and dental technicians (unit group 0-53; occupation 7-41.45).
19. Nurses, professional (unit group 0-41).
20. Professional Workers in transport and communications.
    - *a*) Deck officers, engineer officers, and pilots, ship (minor group 6-0).
    - *b*) Aircraft pilots, navigators, and flight engineers (minor group 6-2).
    - *c*) Radio-communication operators (unit group 6-72).
    - *d*) Inspectors, traffic controllers, and despatchers (minor group 6-6, except occupations 6-62.40 and 6-62.50; unit group 6-93).
21. Non-working foremen[3].

---

[1] Note that working proprietors in wholesale and retail trade are excluded from this category and included among sales workers. Other proprietors « who are not primarily directing and managing enterprises or services, but principally perform professional, technical, craft, service or other functions » are also excluded from this category and are classified according to the particular function they perform (see definition of minor group 1-1).

[2] See footnote 1.

[3] There is no category of « foremen » in the ISCO. Non-working foremen should be classified here. Working foremen are classified in the same occupation as the workers they supervise.

22. Primary and nursery school teachers (occupations 0-69.30 and 0-69.20).

23. Salesmen of insurance and securities (occupations 3-11.20, 3-11.40, 3-11.70, 3-11.90).

24. Professional workers not elsewhere classified (minor group 9-7; minor group 9-8, except occupation 9-81.90; occupations 0-Y9.53, 0-Y9.56, 0-Y9.62, 0-Y9.65, 0-Y9.90[1], 7-61.50, 7-69.40).

25. Clerical workers (major group 2).

26. Sales workers not elsewhere classified (major group 3, except unit groups 3-32 and 3-39 and occupations 3-11.20, 3-11.40, 3-11.70, and 3-11.90).

27. Skilled manual workers (unit group 5-01 except occupation 5-01.90; unit group 5-11; occupations 5-21.20, 5-21.40, 5-21.50; occupations 6-11.15, 6-11.20, 6-11.30; occupation 6-12.15; unit group 6-31; occupations 6-41.15, 6-41.30; unit group 6-51; occupations 6-62.40, 6-62.50; unit groups 6-71, 6-81, 6-91; occupations 6-92.20, 6-92.30; occupation 7-01.15; occupation 7-03.15, 7-03.25, 7-03.40, 7-03.45, 7-03.50, 7-03.55, 7-03.60, 7-03.70; unit group 7-04 except occupation 7-04.90; occupations 7-09.20, 7-09.45, 7-09.50, 7-09.55; unit group 7-11; occupations 7-12.10, 7-12.20, 7-12.30, 7-12.40; unit groups 7-13, 7-14; occupations 7-15.20, 7-15.30; occupations 7-16.20, 7-16.60; occupations 7-19.10, 7-19.20; unit group 7-21; occupations 7-22.15, 7-22.25, 7-22.35, 7-22.45, 7-22.50; unit group 7-23; unit group 7-29 except occupation 7-29.90; unit group 7-31 except occupations 7-31.35, 7-31.65, 7-31.90; occupations 7-32.30, 7-32.40, 7-32.50; unit group 7-33 except occupation 7-33.90; unit group 7-34 except occupation 7-34.90; unit group 7-35 except occupations 7-35.70, 7-35.90; unit group 7-36 except occupation 7-36.90; unit group 7-41 except occupation 7-41.55; unit groups 7-42, 7-43, 7-50; occupations 7-51.30, 7-51.35, 7-51.45, 7-51.50; unit groups 7-52, 7-53; occupations 7-54.10, 7-54.20; unit group 7-55; occupations 7-56.10, 7-56.15, 7-56.25, 7-56.35, 7-56.60; unit group 7-57 except occupations 7-57.50, 7-57.55, 7-57.80; occupations 7-59.15, 7-59.20, 7-59.30, 7-59.50, 7-59.55; unit groups 7-61, 7-62, 7-64, 7-65; occupation 7-63.10; occupations 7-69.50, 7-69.60; unit groups 7-71, 7-72; occupations 7-73.25, 7-73.30, 7-73.40, 7-73.45, 7-73.50, 7-73.60, 7-73.70; unit group 7-79 except occupations 7-79.25, 7-79.35; unit groups 7-81, 7-91, 7-92, 7-93, 7-95; occupations 7-94.20, 7-94.40, 7-94.50; occupations 7-99.10, 7-99.15, 7-99.20, 7-99.45, 7-99.50, 7-99.70, 7-99.85; unit group 8-01 except occupations 8-01.25, 8-01.40, 8-01.90; unit group 8-02 except occupation 8-02.90; occupations 8-03.20, 8-03.30; unit groups 8-04, 8-05; occupations 8-06.20, 8-06.30; occupations 8-09.20,

---

[1] Code number 0-Y9.90 is included here as well as in No. 15. This is a residual group, « Professional, technical and related workers not elsewhere classified, other. » It is intended that professional occupations not elsewhere classified will be included in No. 15, while semi-professional occupations not elsewhere classified will be included here.

8-09.40; occupations 8-11.15, 8-11.20, 8-11.25, 8-11.30, 8-11.60, 8-11.65, 8-11.70; occupations 8-12.10, 8-12.15, 8-12.25, 8-12.35, 8-12.40, 8-12.55; occupation 8-13.20; occupations 8-14.20, 8-14.50, 8-14.60; occupations 8-21.20, 8-21.30; occupations 8-22.10; occupations 8-23.10, 8-23.20, 8-23.30; occupations 8-24.15, 8-24.30, 8-24.40, 8-24.45, 8-24.50; occupations 8-26.10, 8-26.30; unit group 8-27 except occupation 8-27.90; occupations 8-29.15, 8-29.20, 8-29.40; unit group 8-31; occupations 8-32.30, 8-32.40, 8-32.55; occupations 8-34.30, 8-34.40; occupations 8-35.20, 8-35.30; occupations 8-39.15, 8-39.20, 8-39.50, 8-39.60, 8-39.65, 8-39.90; occupations 8-41.20, 8-41.30; occupation 8-42.20; occupations 8-51.20, 8-51.30; occupations 8-52.40, 8-52.60; occupations 8-54.20, 8-54.25, 8-54.30, 8-54.45, 8-54.50, 8-54.55, 8-54.60, 8-54.65; occupations 8-55.20, 8-55.30, 8-55.40, 8-55.50; unit group 8-56; occupations 8-57.15, 8-57.20, 8-57.25, 8-57.35, 8-57.55, 8-57.60, 8-57.65, 8-57.70, 8-57.75, 8-57.80, 8-57.90; occupations 8-58.30, 8-58.45; occupations 8-59.25, 8-59.30; occupations 8-71.20, 8-71.30, 8-71.60; unit group 8-72 except occupations 8-72.30, 8-72.50; unit group 8-73 except occupation 8-73.80; occupations 8-74.15, 8-74.20, 8-74.25, 8-74.30, 8-74.35, 8-74.40, 8-74.60, 8-74.70, 8-74.90).

28. Skilled service and recreation workers (unit groups 9-01, 9-02; occupations 9-11.20, 9-11.40, 9-11.60, 9-11.90; occupations 9-12.20, 9-12.30, 9-12.90; occupations 9-19.70, 9-19.85; occupations 9-41.20, 9-41.30, 9-41.40, 9-41.50, 9-41.90; occupations 9-51.40, 9-51.50).

29. Athletes, sportsmen, and related workers (minor group 9-6).

30. Farmers, fishermen, hunters, loggers and related workers (major group 4).
    - *a*) Farmers and farm managers (minor group 4-0).
    - *b*) Farm workers not elsewhere classified (minor group 4-1).
    - *c*) Hunters, fishermen, loggers, and related workers (minor groups 4-2, 4-3 and 4-4).

31. Unskilled sales workers (unit groups 3-32 and 3-39).

32. Unskilled manual workers (unit groups 5-99, 6-42, 6-43, 6-82, 6-94, 7-02, 7-05, 7-06, 7-39, 7-58, 7-82, 8-19, 8-25, 8-33, 8-43, 8-49, 8-53, 8-61, 8-75, 8-76, 8-81, 8-99, as well as all occupations which are not numerated under « Skilled manual workers » (No. 27) and which belong to the major groups 5, 6, 7 and 8, except the following occupations : occupation 7-41.45 (in No. 18); all occupations in the minor groups 6-0, 6-2 and in the unit groups 6-72, 6-93, 6-61, and the occupations 6-62.15, 6-62.20, 6-62.30, 6-62.60, 6-62.90 (in No. 20).

33. Unskilled service and recreation workers (unit group 9-09; occupations 9-11.30, 9-11.50; occupation 9-12.40; occupations 9-19.20, 9-19.30, 9-19.40, 9-19.50, 9-19.60, 9-19.80, 9-19.90; unit groups 9-21, 9-31, 9-32, occupations 9-41.60, 9-41.70; occupations 9-51.10, 9-51.20, 9-51.30, 9-51.60, 9-51.70, 9-51.90; occupation 9-81.90; unit groups 9-99, 0-42, 0-49).

Annex IX

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